

## Volume III

## Program Cost Estimates

February 1975

# Tug Fleet and Ground Operations Schedules and Controls

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**MARTIN MARIETTA**

MCR-74-488

NAS8-31011

Volume III

Program

Cost

Estimates

February 1975

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**TUG FLEET AND GROUND  
OPERATIONS SCHEDULES  
AND CONTROLS**

**MARTIN MARIETTA CORPORATION**

**P. O. Box 179**

**Denver, Colorado 80201**

## FOREWORD

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This final report, submitted in accordance with Data Procurement Document number 480 dated June 1974, contract NAS8-31011, is published in three volumes:

Volume I - Executive Summary (DRL MA-04)

Volume II - Part I Final Report (DRL MA-03)

Part II Addenda (DRL MA-03)

Part III Appendixes (DRL MA-03)

Volume III - Program Study Cost Estimates (DRL MF003M)

The content of each volume is shown in the diagram on the following page.

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TUG FLEET AND GROUND OPERATIONS SCHEDULES AND CONTROLS, FINAL REPORT (NAS8-31011)

Volume I  
Executive  
Summary

- Introduction
- Method of Approach
- Basic Data and Significant Results
- Concluding Remarks

Volume II  
Part I  
Final Report

- Introduction
- Synopsis of Study Elements
- Subplans
  - A-Tug Operational Subplan
  - B-IUS/Tug Fleet Utilization Subplan
  - C-IUS/Tug Payload Integration Subplan
  - D-Space Tug Site Activation Subplan
  - E-IUS/Tug Transition Phase Subplan
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- Supporting Research & Technology
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Program Cost  
Estimates

- Introduction
- DDT&E Launch Site Activation-Timeline Funding
- Operations - Tug Launch Site Support Timeline Funding
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## GLOSSARY

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|         |  |
|---------|--|
| A&E     | Architectural and Engineering                |
| APS     | Auxiliary Propulsion System                  |
| C&W     | Caution and Warning                          |
| CCB     | Configuration Control Board                  |
| CCMS    | Command Control Monitoring System            |
| CDS     | Central Data System                          |
| CKAFS   | Cape Kennedy Air Force Station               |
| COR     | Contracting Office Representative            |
| CST     | Combined Systems Test                        |
| CTMCF   | Common Tug Maintenance and Checkout Facility |
| DA      | Double Amplitude                             |
| DOD     | Department of Defense                        |
| EMC/EMI | Electromagnetic Compatibility/Interference   |
| ETR     | Eastern Test Range                           |
| F/C     | Fuel Cell                                    |
| FCR     | Facilities Change Request                    |
| FECP    | Facilities Engineering Change Proposal       |
| FIT     | Functional Interface Test                    |
| FMEA    | Failure Modes and Effect Analysis            |
| FWG     | Facility Working Group                       |
| GSE     | Ground Support Equipment                     |
| HIM     | Hardware Interface Module                    |
| H.P.    | High Pressure                                |
| I/F     | Interface                                    |

|         |   |
|---------|---|
| I/O     | Input/Output  |
| IOC     | Initial Operational Capability                        |
| IUS     | Interim Upper Stage                                   |
| JSC     | Johnson Space Center                                  |
| KPF     | Kick Stage Processing Facility                        |
| KSC     | Kennedy Space Center                                  |
| LCC     | Launch Control Center                                 |
| L.P.    | Low Pressure  |
| LPS     | Launch Processing System                              |
| LRU     | Line Replaceable Unit                                 |
| MDF     | Mate-Demate Fixture                                   |
| MIC     | Management Information Center                         |
| MPS     | Main Propulsion System                                |
| MSFC    | Marshall Space Flight Center                          |
| MSI     | Maintainability Significant Item                      |
| MSS/PSS | Mission Specialist Station/Payload Specialist Station |
| MTBF    | Mean Time between Failure                             |
| MTBR    | Mean Time between Repair                              |
| NASA    | National Aeronautics Space Administration             |
| NN/D    | Non-NASA/DOD  |
| O&M     | Operation and Maintenance                             |
| OFI     | Operational Flight Instrumentation                    |
| OIS     | Operational Intercommunication System                 |
| OLF     | Orbiter Landing Field                                 |
| OMD     | Operations Maintenance Documentation                  |



|      |   |
|------|---|
| OMI  | Operational Maintenance Instruction     |
| OPF  | Orbiter Processing Facility             |
| PCR  | Payload Changeout Room                  |
| P/L  | Payload                                 |
| PMF  | Payload Mate Facility                   |
| PPR  | Payload Processing Room                 |
| RFP  | Request for Proposal                    |
| RMS  | Remote Manipulator System               |
| RTG  | Radioisotopic Thermal Generator         |
| S&E  | Science and Engineering                 |
| SAWG | Site Activation Working Group           |
| S/C  | Spacecraft                              |
| SCF  | Satellite (Spacecraft) Control Facility |
| SGLS | Space Ground Link System                |
| SHE  | System Health Evaluation                |
| SPF  | Spacecraft Processing Facility          |
| SSPD | Space Shuttle Payload Description       |
| SRT  | Supporting Research and Technology      |
| STDN | Space Tracking and Data Network         |
| STS  | Space Transportation System             |
| TBD  | To be determined                        |
| TFP  | Tug Processing Facility                 |
| TSE  | Transportation Support Equipment        |
| VAB  | Vertical Assembly Building              |
| VSWR | Voltage Standing Wave Ratio             |
| WBS  | Work Breakdown Structure                |

# I. INTRODUCTION

## I. INTRODUCTION

This volume contains detailed cost data for the Tug DDT&E and operations phases. Option 6 is the recommended option selected from seven options considered and was used as the basis for ground processing estimates. Option 6 provides for processing the Tug in a factory clean environment in the low bay area of VAB with subsequent cleaning to visibly clean. The basis and results of the trade study to select Option 6 processing plan is included. Cost estimating methodology, a work breakdown structure, and a dictionary of WBS definitions is also provided.

### A. LIFE CYCLE COST METHODOLOGY

#### 1.0 Introduction

The costing approach used in this study draws upon the historical data applied to the selected ground operations functional configuration, augmented with new data to cost the DDT&E and operational phases. Trade and sensitivity studies were used to refine the data used. This costing approach is illustrated in Figure 1.

A detailed manpower timeline and staffing was developed by analysis of job functions necessary to perform the specific site activities. Appropriate engineering personnel estimated manpower requirements at WBS Level 5 for each task. Propellant costs were developed from detailed estimates of quantities with current pricing and loss factors from the KSC propellant plan for Shuttle. Miscellaneous materials were estimated at \$0.17/manhour for each site to cover normal material usage by engineers and technicians. Skylab history was used to develop the cost of \$0.81/manhour for travel between the launch sites and the central project management site. Special travel of launch crews was estimated using airline fares, car rental, per diem and TDY allowances currently in effect. Other direct charges are estimated at 2.5% of total direct labor dollars and provide for equipment rental, freight costs, operating supplies and other direct expenses.

#### 2.0 Data Bank

Computer usage was categorized as either business or scientific. The IBM 370 system was used for business management and the usage rate estimated from past experience requirements from similar tasks. For front end processing, keypunch effort of 13 hrs/computer unit is based on past performance.

The requirements of engineering usage by the Central Fleet Management sustaining engineering department, and the complex job of Fleet Management of the entire Tug program, seems to warrant the full time availability of a high speed, large scale computer. The CDC 6000 computer was used to establish the rates for full time usage requirements.

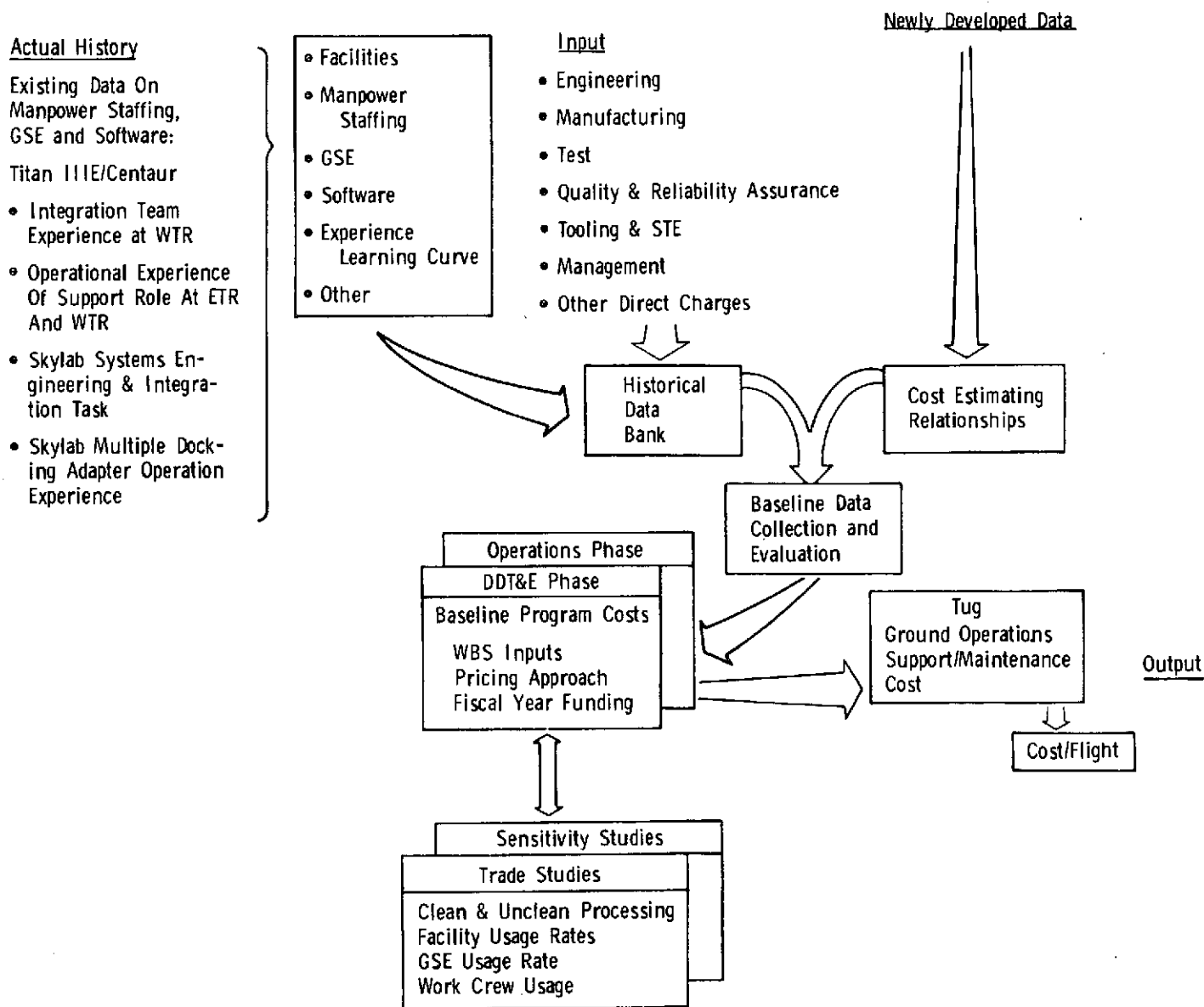


Figure 1 Tug Ground Operations Life Cycle Cost Approach

The historical data and newly developed data was collected and input to the appropriate WBS elements. Under NASA direction basic pricing rules such as a uniform overhead rate was established.

### 3.0 Trade and Sensitivity Studies

Two interdependent trades were required to establish a basis for the Tug processing plan. One trade involved whether the Tug should be processed in a factory clean environment or in a 100K clean environment. Concurrently, it was necessary to make a choice of the facilities where the processing was to take place.

Numerous approaches of IUS-Tug operations were considered. Through a selective process these approaches were reduced to seven options:

- 1) 100K clean Tug processing in dedicated facilities;
- 2) 100K clean Tug processing, spacecraft mate in user facility;
- 3) 100K clean Tug processing, PCR mate option;
- 4) Factory clean Tug processing, spacecraft mate in separate integration facility;
- 5) Factory clean Tug processing, single security area for DOD payloads;
- 6) Factory clean Tug processing in joint IUS/Tug facility;
- 7) Factory clean Tug processing, separate IUS and Tug facilities.

### 4.0 Operations Philosophy

In all seven options, there are three common considerations that impact the ground operations philosophy.

- 1) DOD is responsible for IUS development and procurement;
- 2) NASA is responsible for Tug development and procurement;
- 3) NASA is responsible for kick stage development and procurement.

These considerations affect ground operation in that the agency responsible for development and procurement of the stage is also responsible for the procurement, provisioning, and inventory management of flight vehicle spares, the GSE and GSE spares, GSE maintenance, the logistics system, crew training and certification, checkout procedure preparation, revision and update, GSE and checkout software preparation and update. These factors, plus the DOD security requirements, have been included in the evaluation and reduction of the approaches considered to the seven options selected to be further discussed.

A cost summary of these seven options are shown in Table 1. Detailed description and technical assessment and comparison of each option is shown in Subplan D, Volume II, Part I.

The operations phase manpower is held at a constant level to support the program. Fluxuations in cost is driven by spares and propellant usage rates which are related to launch rates. The average cost per flight is developed from the cost of the operations phase only and does not include the vehicle cost nor mission operations cost.

## B. WORK BREAKDOWN STRUCTURE

The Space Tug Ground Operations Study Work Breakdown Structure (WBS) is derived from a WBS used for the Space Tug Systems Study. It provides the framework for structuring the various technical plans, operational schedules, cost and manpower estimates for the DDT&E and operations phases.

Figures 2 and 3 display the WBS Identification Number Sequence. This numbering sequence is consistent with the established Tug Program WBS levels throughout; however, between Level 3 and Level 4 a Project Function (PF) designator is added to present the separate costs for Tug Fleet Utilization Project Management and Ground and Launch Operations at ETR and WTR. This change in structure from the original study WBS presents the data under the same WBS numbers. However, data cannot be directly correlated to the earlier study results.

Definitions for each element displayed in the WBS are found in the dictionary in Section IV.

## C. SELECTED OPTION FACILITY, GSE AND MANPOWER REQUIREMENTS

### 1.0 Facility and GSE

The trade study of the various options for processing involved the listing of all facility modifications and additions. The costs of the modification were estimated by construction estimating personnel familiar with the Eastern Test Range facilities current status and future plans for development. The lists of ground support equipment for Tug, IUS and Kick Stage processing were developed and costs estimated on each individual item when it was practical to do so. The quantities of the individual GSE items were assigned to the options and the results are shown in Table 1. The costs were further summarized to show the cost of the various GSE and facilities. The "other facilities" are not vehicle unique and are launch pad mods, warehouse and orbiter processing facility costs. Figure 4 depicts the IUS, Tug and Kick Stage flight hardware flow for this option. Upon return from a mission, the Tug is removed from the Orbiter and is separated from the spacecraft in the OPF. The Tug is moved to the TPF where it undergoes refurbishment and checkout in the as-received condition in a factory clean area. For IUS missions, a new IUS from the manufacturer or storage will be moved to the TPF for checkout.

Table 1 Summary, Option Trade Studies

|                               |                | Option<br>I     | Option<br>II    | Option<br>III   | Option<br>IV    | Option<br>V     | Option<br>VI  | Option<br>VII |
|-------------------------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------------|---------------|
| DESCRIPTION                   |                | \$              | \$              | \$              | \$              | \$              | \$            | \$            |
| DOLLARS IN THOUSANDS          |                |                 |                 |                 |                 |                 |               |               |
| Tug Avionics                  |                | 3,048           | 1,853           | 2,038           | 2,038           | 2,038           | 1,853         | 1,853         |
| Tug Handling & Transportation |                | 7,751           | 5,061.5         | 4,833           | 4,563           | 4,311.5         | 3,978         | 3,978         |
| Propulsion & Mech. GSE (Tug)  |                | 2,489           | 1,586           | 1,626           | 1,626           | 1,626           | 1,536         | 1,536         |
| Tug Facility Mods (SAEF)      |                | 1,314.7         | 1,134.7         | 1,134.7         | 330             | 280             | 0             | 0             |
| " " " (VAB)                   |                | 0               | 0               | 0               | 375             | 1,375           | 1,375         | 1,375         |
| Structural (GSE)              |                | 240             | 120             | 120             | 120             | 120             | 120           | 120           |
| Secure Area                   |                | 50              | 90              | 50              | 30              | 20              | 30            | 15            |
| L.P.S. Terminal               |                | 4,650           | 4,650           | 4,650           | 9,900           | 4,450           | 4,450         | 4,650         |
| IUS Facilities (SAEF & VAB)   |                | 297.5           | 270.6           | 270.6           | 60              | 453.3           | 60            | 60            |
| Kick Stage (GSE "H")          |                | 1,550           | 1,290           | 1,290           | 1,280           | 1,290           | 1,290         | 1,290         |
| Avionics "A"                  |                | 936             | 936             | 936             | 936             | 936             | 936           | 936           |
| Propulsion & Mech.            |                | 576             | 576             | 576             | 576             | 576             | 576           | 576           |
| Engine Area Facility          |                | 92.5            | 92.5            | 92.5            | 50              | 50              | 50            | 50            |
| Warehouse & Roads             |                | 270.5           | 270.5           | 270.5           | 270.5           | 270.5           | 270.5         | 270.5         |
| IUS Unique GSE                |                | 200             | 200             | 200             | 200             | 200             | 0             | 0             |
| Launch Pad Mods               |                | 78              | 78              | 156             | 78              | 78              | 78            | 78            |
| Orbiter Processing Facility   |                | 217.5           | 217.5           | 217.5           | 217.5           | 217.5           | 217.5         | 217.5         |
| Payload Mate IUS Facility     |                |                 |                 |                 | 268.6           |                 |               |               |
| TOTAL                         |                | <u>23,760.7</u> | <u>18,426.3</u> | <u>18,460.8</u> | <u>22,918.6</u> | <u>18,291.8</u> | <u>16,820</u> | <u>17,005</u> |
| SUMMARY                       |                |                 |                 |                 |                 |                 |               |               |
| Group 1                       | Tug Unique GSE | 13,528          | 8,620.5         | 8,617           | 8,347           | 8,095.5         | 7,487         | 7,487         |
| " 2                           | Tug Facilities | 6,107.2         | 5,967.2         | 5,927.2         | 10,685          | 6,175           | 5,905         | 6,090         |
| " 3                           | IUS Unique GSE | 200             | 200             | 200             | 200             | 200             | 0             | 0             |
| " 4                           | IUS Facilities | 297.5           | 270.6           | 270.6           | 328.6           | 453.3           | 60            | 60            |
| " 5                           | Kick Stage GSE | 3,062           | 2,802           | 2,802           | 2,792           | 2,802           | 2,802         | 2,802         |
| " 6                           | Other Fac.     | 566             | 566             | 644             | 566             | 566             | 566           | 566           |
| OPTION TOTAL                  |                | <u>23,760.7</u> | <u>18,426.3</u> | <u>18,460.8</u> | <u>22,918.6</u> | <u>18,291.8</u> | <u>16,820</u> | <u>17,005</u> |

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LEVEL 3

PROJECT  
FUNCTIONS

LEVEL 4

LEVEL 5

SUBDIVISIONS OF WORK

ENGINEERING

MANUFACTURING

TEST

QUALITY & RELIABILITY ASSURANCE

TOOLING & STE

MANAGEMENT/OTHER

320  
SPACE TUG PROJECT

32A  
DDT&E  
(GROUND OPERATIONS)

32A-1A  
TUG FLEET UTILIZATION/  
PROJECT MANAGEMENT

32A-1B  
GROUND & LAUNCH  
OPERATIONS - ETR

32A-1C  
GROUND & LAUNCH  
OPERATIONS - WTR

32A-1A-01  
PROJECT  
MANAGEMENT

32A-1A-02  
SYSTEMS ENGR  
& INTEGRATION

32A-1A-05  
LOGISTICS

32A-1A-15  
SOFTWARE

32A-1B-01  
SITE  
MANAGEMENT - ETR

32A-1B-06  
FACILITIES  
(ETR)

32A-1B-07  
GROUND SUPPORT  
EQUIPMENT (ETR)

32A-1C-01  
SITE  
MANAGEMENT - WTR

32A-1C-06  
FACILITIES  
(WTR)

32A-1C-07  
GROUND SUPPORT  
EQUIPMENT (WTR)

- 01 COST/PERFORM-  
ANCE MGMT
- 02 PROJECT  
DIRECTION
- 03 INFORMATION  
MANAGEMENT
- 04 FLEET UTILIZATION

- 01 TUG SYSTEMS  
ENGINEERING
- 04 SUSTAINING  
ENGINEERING

- 01 TRANSPORTATION  
& HANDLING
- 02 TRAINING
- 03 INVENTORY CONTROL  
& WAREHOUSING
- 04 DEPOT MAINTENANCE

- 03 GSE

- 02 PROJECT  
MANAGEMENT
- 03 INFORMATION  
MANAGEMENT

- 03 ETR MAINT  
& REFURBISH
- 04 ETR LAUNCH
- 07 FACILITY  
OPERATION SUPPORT

- 02 EAST TEST RANGE  
GSE

- 02 PROJECT  
MANAGEMENT
- 03 INFORMATION  
MANAGEMENT

- 05 WTR MAINT  
& REFURB
- 06 WTR LAUNCH
- 08 FACILITY  
OPERATION SUPPORT

- 03 WEST TEST RANGE  
GSE

WORK BREAKDOWN STRUCTURE FOR THE TUG FLEET AND  
GROUND OPERATIONS SCHEDULES AND CONTROLS STUDY

FOLDOUT FRAME

FOLDOUT FRAME

FOLDOUT FRAME

FIGURE 2 DDT&E WBS

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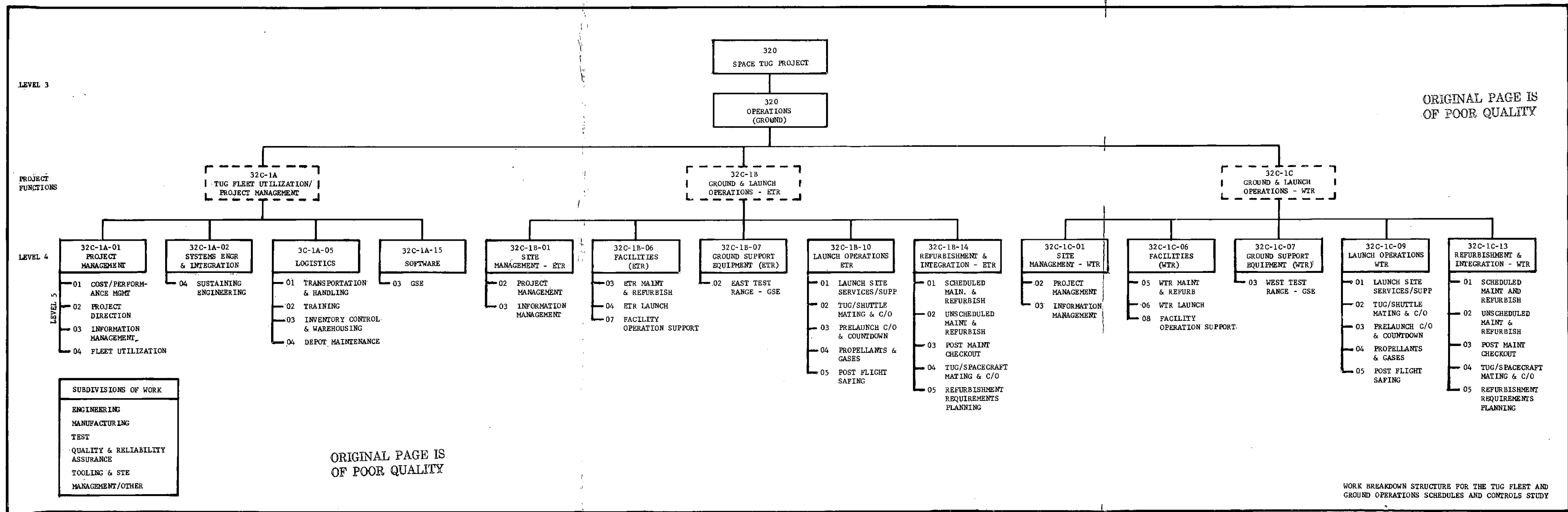


FIGURE 3 OPERATIONS WBS

FOLDOUT FRAME

FOLDOUT FRAME

FOLDOUT FRAME

3

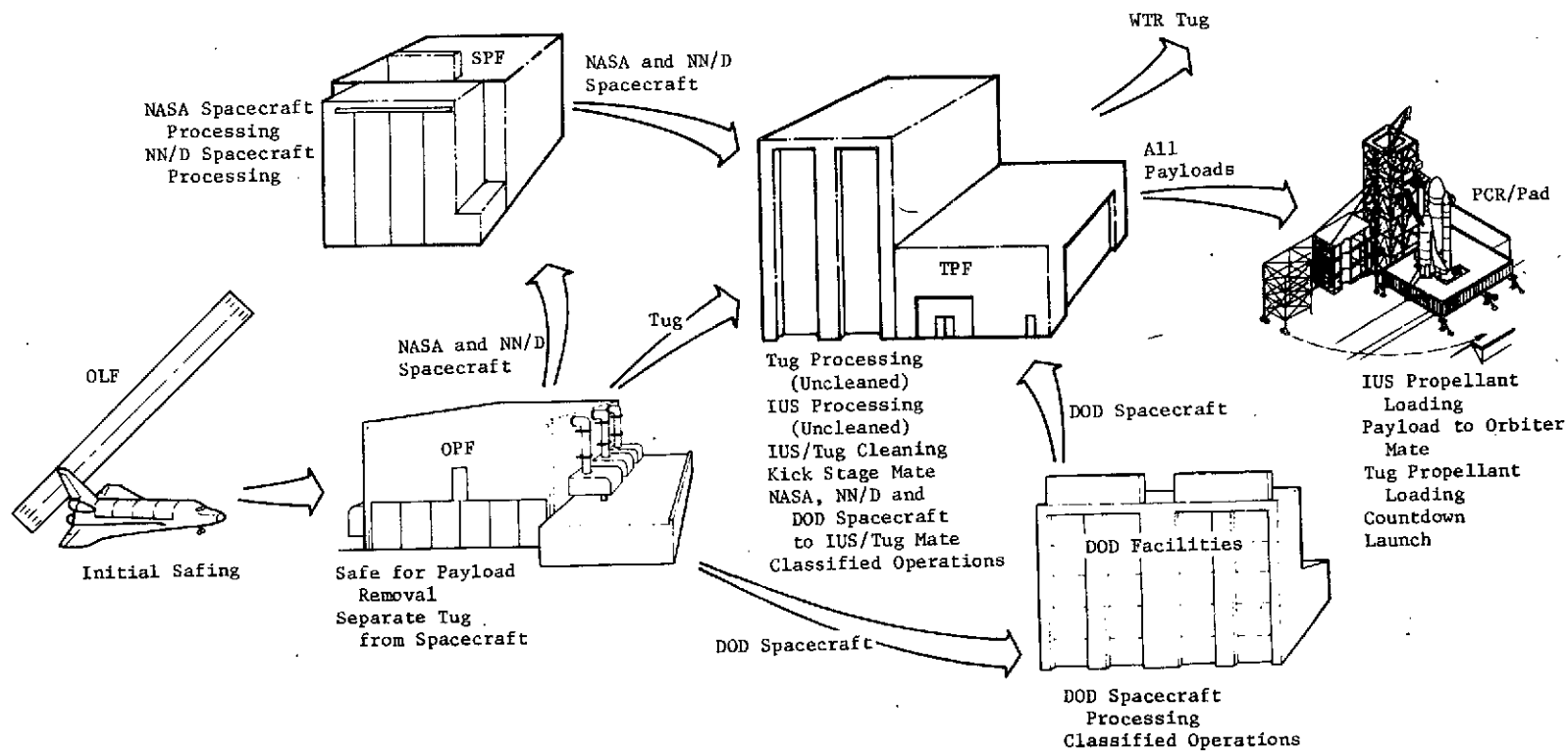


Figure 4 Factory Clean Processing in Joint IUS/Tug Processing Facility

The Tug is cleaned to be compatible with a 100K level after completion of refurbishment, postmaintenance checkout and APS propellant loading. The spacecraft (DOD, NASA, and NN/D), and any Kick Stages required, are moved to the TPF and mated to the IUS/Tug. Integrated testing is then performed, and the payload is moved to the PCR/pad for Shuttle mate and prelaunch operations.

In the recommended option, all IUS and Tug processing is done in a facility jointly occupied by NASA and DOD. Secure areas/cells will be required for DOD operations in the TPF. The PCR/pad and OPF will require the same security provisions as on other options. Table 2 is a summary of facility and GSE requirements for this option.

### 1.1 Facility - New and Modified

1.1.1 General - The new and modified facilities identified in this study follow:

- 1) TPF - VAB low-bay - An existing building and support facilities at KSC, modified to provide the Tug/IUS processing facility by:
  - a) Modifying two existing checkout cells for Tug processing, and two existing checkout cells for IUS processing. These four cells are identified in Figure 5.
  - b) Modifying existing shop, lab, office, and storage areas to support Tug and IUS processing.
- 2) Launch Complex 39A - The assumption is made that the PCR had been constructed and in use for the IUS program, and that an IUS-to-Orbiter insertion manipulator is in existence. The principal modifications to LC39A to accommodate the full Tug/Spacecraft/Kick Stage combination then become:
  - a) Modification/adjustment of PCR platforms to accommodate Tug/spacecraft diameters and work stations;
  - b) Modification/adjustment of the PCR manipulator for the Tug diameter and hard point locations;
  - c) Modification of existing  $LH_2$  and  $LO_2$  piping to interface with new GSE Tug  $LH_2/LO_2$  propellant<sup>2</sup> loading units;
  - d) Addition/modification of LPS interfaces for Tug requirements;
  - e) Provision of electrical interfaces at the LCC for GSE Tug monitoring and propellant loading consoles.

Table 2 Option 6 Facility and GSE Requirements

| Consideration              | TPF | DOD | Pad/<br>PCR | OPF | KPF |
|----------------------------|-----|-----|-------------|-----|-----|
| Secure Area                | x   | x   |             | x   | x   |
| LPS Terminal               | x   |     | x           | x   | x   |
| Clean Area (Bldg)          |     |     | x           |     |     |
| Airlock                    |     |     |             |     |     |
| Tug Unique GSE             |     |     |             |     |     |
| Avionics                   | x   |     |             |     |     |
| Handling and Support       | x   |     |             | x   |     |
| Propulsion and Mechanical  | x   |     |             |     |     |
| Structural                 | x   |     |             |     |     |
| Tug Facilities             |     |     |             |     |     |
| Engine Area                | x   |     |             |     |     |
| Avionics Area              | x   |     |             |     |     |
| H <sub>2</sub> Burn System | x   |     |             | x   |     |
| O <sub>2</sub> Vent System | x   |     |             | x   |     |
| GSE Area                   | x   |     |             |     |     |
| APS Load System            | x   |     |             |     |     |
| Portable Clean Room        | x   |     |             |     |     |
| Kick Stage GSE             |     |     |             |     |     |
| Avionics                   |     |     |             |     | x   |
| Handling and Transport     | x   |     |             |     | x   |
| Propulsion and Mechanical  | x   |     |             |     | x   |
| Kick Stage Facility        |     |     |             |     |     |
| Buildup and Checkout Area  |     |     |             |     | x   |
| Avionics Area              |     |     |             |     | x   |
| GSE Area                   |     |     |             |     | x   |

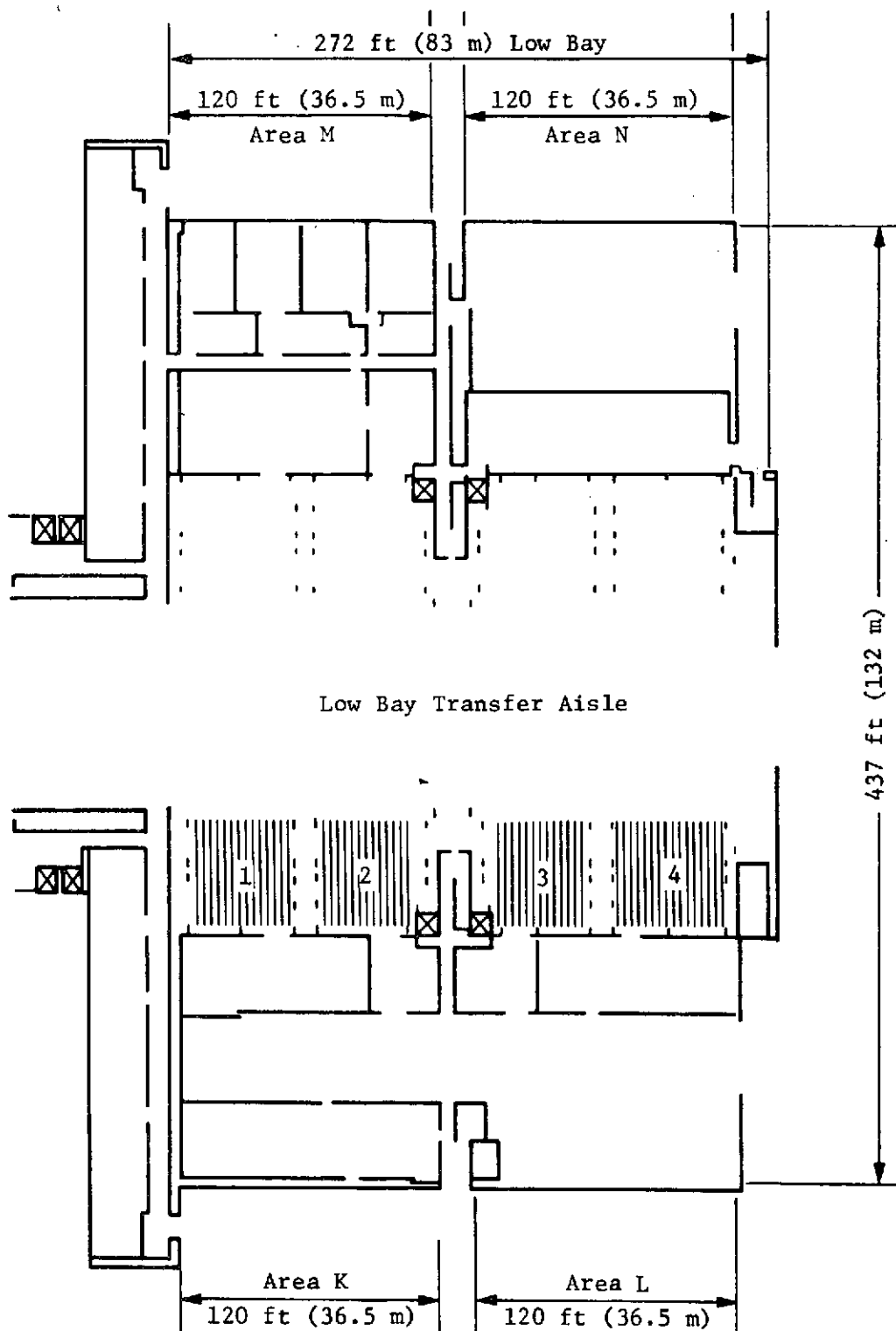


Figure 5 VAB Low Bay TPF Layout

- 3) Kick Stage Processing Facility - An existing facility (to be determined) for processing the solid rocket motor kick stage. Facilities under consideration include:

- a) Explosive Safe Area-60-A (CCAFS);
- b) TIIIC SRM Facility (CCAFS).

Peculiar handling equipment would be provided as GSE. Existing electrical/pneumatic sources would accommodate Kick Stage requirements using GSE adapters.

- 4) Orbiter Processing Facility - The existing facility being developed for Shuttle postflight processing should include these Tug peculiar requirements, including:

- a) An 8-ton (7260 kg) overhead crane capability;
- b) 150 x 60 ft (48 x 18.2 m) floor area;
- c) Storage and maintenance area;
- d) Eye washes and showers;
- e) Added/relocated electrical outlets and pneumatic connections;
- f) Office and crew space.

Tank purge, propellant disposal and Tug/spacecraft handling equipment would be furnished as GSE.

- 5) Spacecraft Processing Facilities - Individual spacecraft requirements will determine any facility modification requirements to the existing facilities at CKAFS and KSC where NASA and DOD spacecraft are processed at present. These include buildings AO, AM, AE, SAB (at CKAFS) and the O&C Building SAEF #1 and SAEF #2 (MILA Industrial Area). Additional facilities may be required depending upon spacecraft launch rate and launch preparation/checkout time.

- 6) WTR Facilities - With the Tug processing facility at ETR only, the new/modified WTR facilities required to support Tug operations would include:

- a) OPF - Modified to provide crane support, Tug-peculiar commodities, office, crew, shop, and storage space;

- b) PCU/PAD SLC-6 - Modified to provide propellant and pneumatic interfaces for the GSE LH<sub>2</sub> and LO<sub>2</sub> loading units and LPS interfaces; platform modifications/adjustments for Tug diameter and working stations; modification/adjustment of the PCR manipulator to accommodate Tug hard points; addition of electrical interfaces in the Control Center for Tug monitor and loading consoles;
- c) Payload Processing Facility (PPR) - A facility modified to accept Tug and Tug GSE for Tug/spacecraft integrated checkout.

1.1.2 TPF-VAB Low Bay Modifications - Modifications to the VAB low bay and adjacent areas required to provide Tug and IUS processing capability follow:

- 1) Platforms and movable stands in cells 1 and 2 modified to accommodate the 14.7 ft (4.47 m) diameter Tug.
- 2) Platforms and movable stands in cells 3 and 4 modified to accommodate the 10 ft (3 m) diameter IUS.
- 3) Cells to be enclosed and air conditioned. Spacecraft levels to have class 100,000 clean inlet air available.
- 4) Cell doors to be sealable to canister entry.
- 5) Provide "slick" surface floors, walls, and ceilings where particulate cannot settle and later recirculate due to work activities and air circulation.
- 6) Additional security provisions to be made for one Tug and one IUS spacecraft level clean rooms.
- 7) Air conditioning will require two primary A/C units, two backup A/C units, ducting, and control equipment. Ducts and electrical wiring to be made secure for cells 2 and 3.
- 8) Upgrading of the existing monorail cranes to a minimum 7-ton (6350 kg) capacity.
- 9) Propellant disposal piping and vent/burn stacks to be added from the cells to the VAB roof. Floor drains, wash-down hoses, and eye washes are to be provided. (Propellants requiring disposal facilities include for the Tug, H<sub>2</sub>, O<sub>4</sub>, N<sub>2</sub>H<sub>4</sub>, and for the IUS, N<sub>2</sub>H<sub>4</sub>, UDMH, and N<sub>2</sub>O<sub>4</sub>.)
- 10) Provision of a Tug cell checkout control room (for control consoles, LPS terminal, etc.) (To be a modified existing room.)
- 11) Allocation of existing rooms for labs, shops, offices, and personnel locker rooms.

- 12) Modification of existing areas to provide environmentally controlled bonded storage areas.
- 13) Blast barriers to be provided between adjacent cells.

Figure 6 shows a proposed layout of the VAB low bay cells 1 and 2 and the adjoining support areas to accommodate the Tug processing facility requirements. Figure 7 shows cells 3 and 4, which would be modified to accommodate IUS checkout facility requirements. Figure 8 depicts a typical external view of the checkout cells showing the door arrangement into the transfer aisle. Figure 9 presents a typical internal view of the checkout cells showing the clean area locations.

1.1.3 Security Provisions - Additional security provisions will be added to one Tug and one IUS cell at the spacecraft levels for use during checkout of DOD spacecraft. Included in these provisions will be the following:

- 1) Entry into the spacecraft clean room by authorized personnel will be via an airlock at one level only. The airlock will be constructed so that there is no direct line-of-sight into the secure area from outside, and inner and outer doors will be interlocked. A security guard will be posted at the entrance to the airlock. All personnel will be logged in and out.
- 2) Equipment entry will be provided at one level via airlock. This entry will normally be closed except when moving equipment and will not be used for personnel entry.
- 3) Emergency exit doors will be provided at all work levels. These doors will be made so they cannot be opened from the outside.
- 4) Movement of personnel between levels will be by ladder or stairway within the secure area.
- 5) A display panel will be provided at the guard station to indicate when a door is open or closed.
- 6) Blue, revolving beacon lights will be provided to indicate when a DOD spacecraft is in the secure area.
- 7) Wide-band rejection filters will be installed in all power and lighting circuits entering the secure area.
- 8) All necessary openings into the area will be baffled to prevent viewing and/or provided with steel bar grills to prevent personnel entry (including inlet and outlet airconditioning ducts).



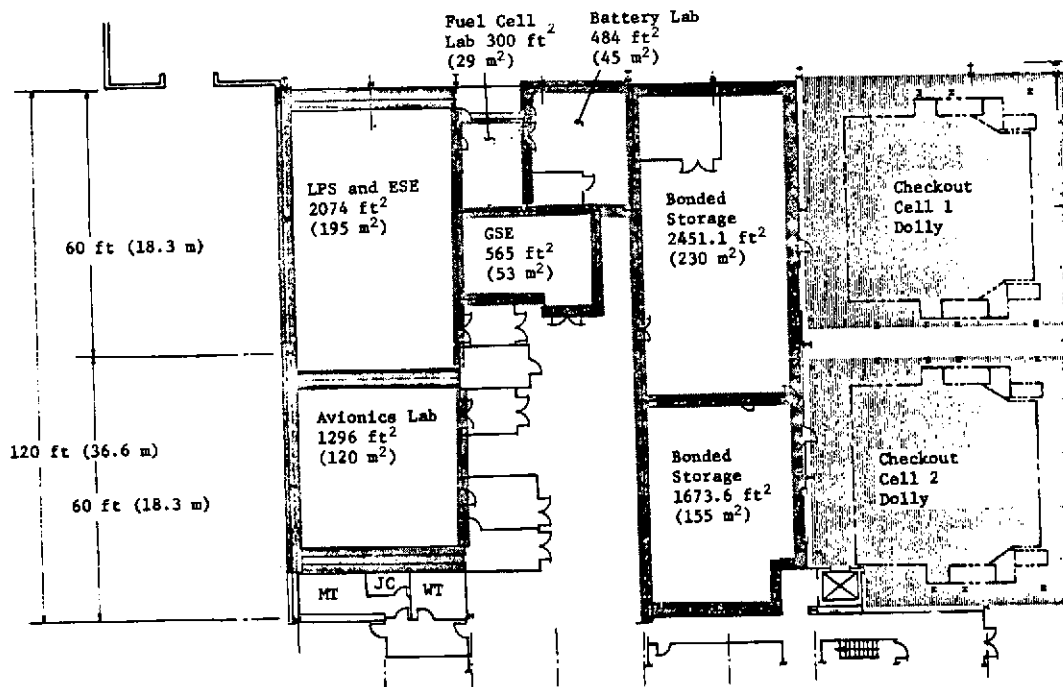


Figure 6 VAB Low Bay Tug Processing Area

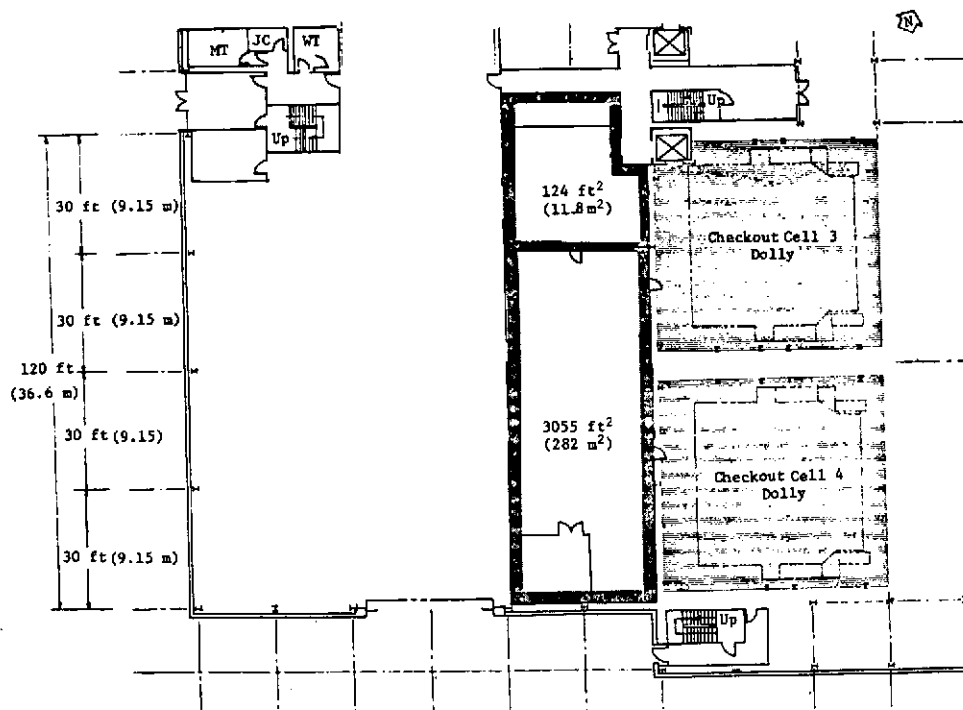


Figure 7 VAB Low Bay IUS Processing Area

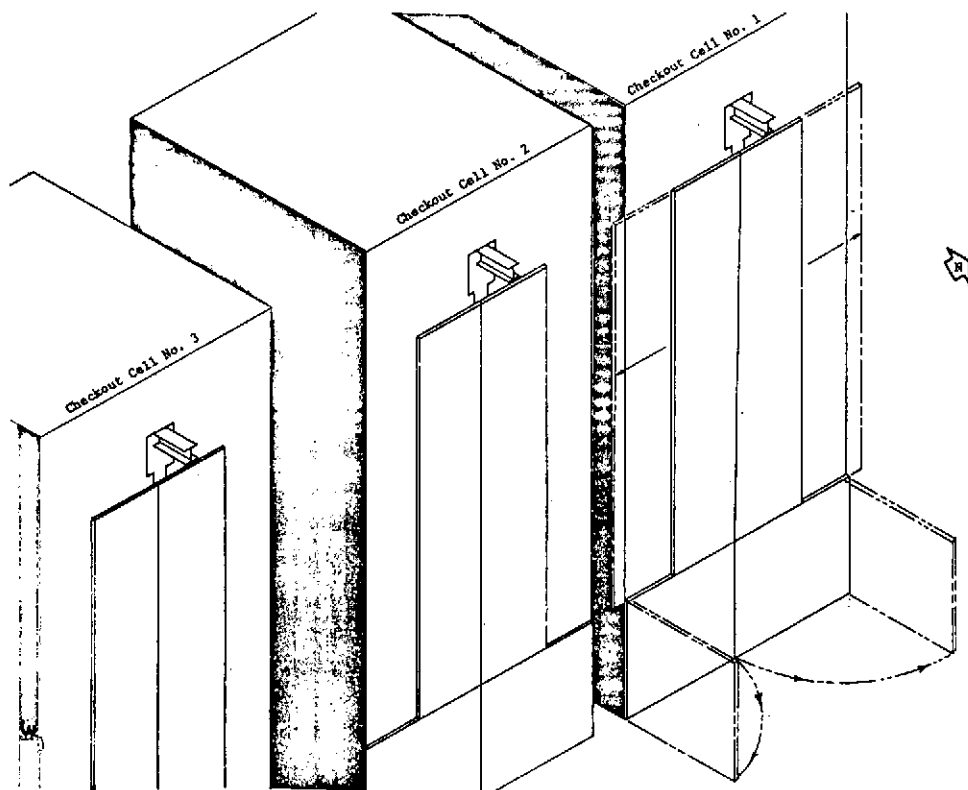


Figure 8 VAB Low Bay Area K

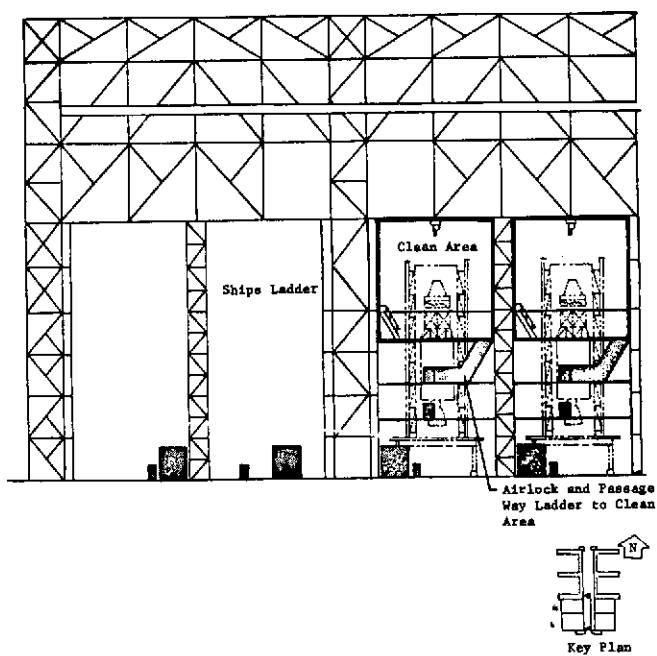


Figure 9 VAB Low Bay Cell Clean Area

- 9) There will be no direct view into the secure area from the lower cell levels.
- 10) The opening at the bottom of the spacecraft will be sealed with a boot that is provided with an R-F seal.

1.1.4 Tug Facility Requirements Specification Data Sheets - The new/modified facilities requirements are described in detail in the Tug Facility Requirements Specification Data Sheets contained in Appendix D, Vol. II, Part III.

1.1.5 IUS Facility Requirements - The IUS checkout cell facilities in the VAB low bay have been described previously. IUS facility requirements at the OPF, launch pad and other sites are outside the scope of this study.

## 1.2 GSE

The new/modified operational GSE to be used during Tug site activation will include:

- 1) Avionics checkout and monitoring equipment;
- 2) Handling, access, and transportation equipment;
- 3) Propulsion, pneumatic, and mechanical checkout and servicing equipment;
- 4) Structural integrity inspection equipment.

The Tug GSE required is identified and described in detail in the Tug GSE specification data sheets contained in Appendix B, Volume II, Part II, and summarized in Table 3.

## 1.3 Transportation Requirements and Support

1.3.1 Tug Canister/Transporter - The canister/transporter concept developed in previous studies could be used on the Tug program. Figure 10 shows one proposed concept for this equipment. This canister/transporter is not Tug unique and is not priced in the GSE costs.

Should the equipment final design evolve a universal canister/transporter, then adaptation for Tug would involve only adjustment of the internal mounting hard points to accommodate the Tug diameter and hard point locations. If the universal concept proves impractical, the basic requirements for Tug would be the following:

- 1) Capability of housing a 15.0 ft (4.57 m) diameter by 60 ft (18.3 m) length payload that could consist of Tug/Kick Stage, spacecraft or other configurations in a vertical position;

Table 3

Ground Support Equipment Matrix

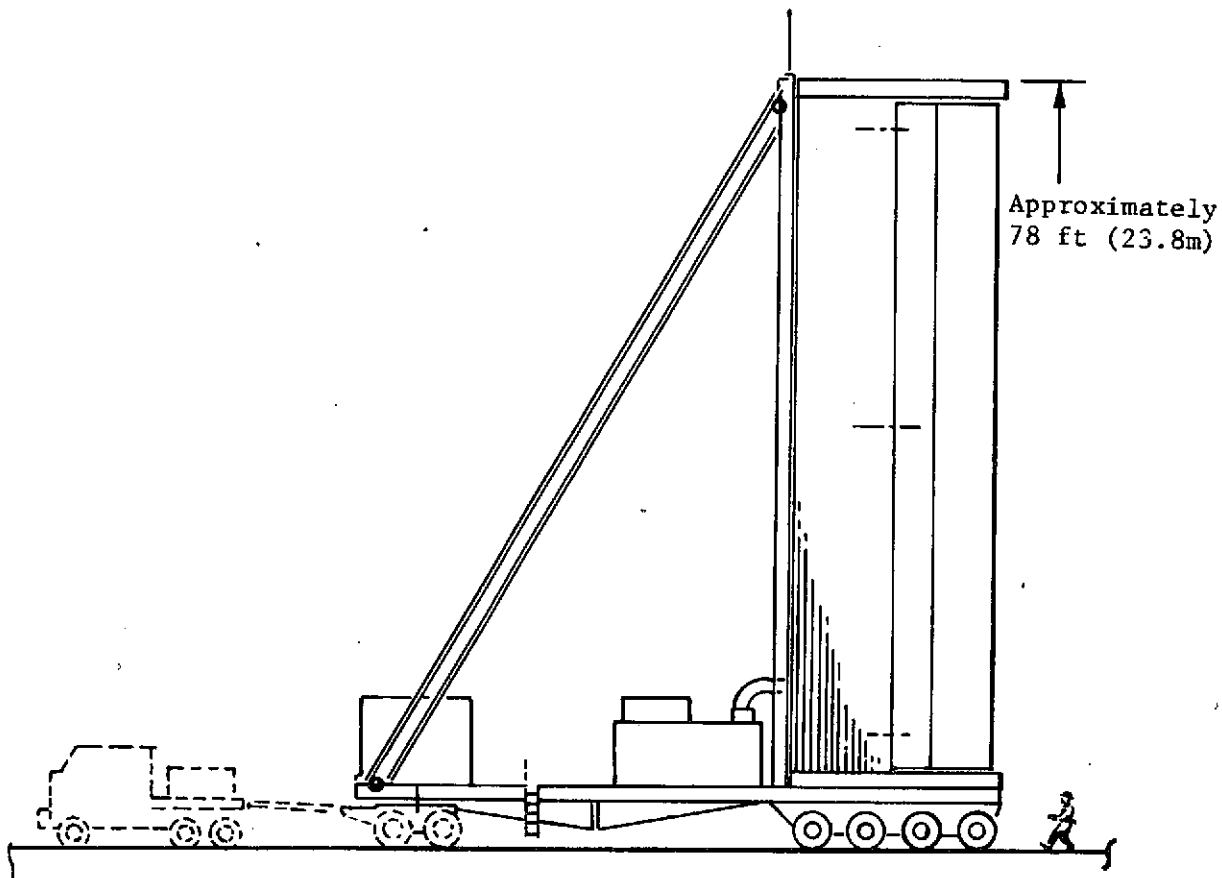
| ID No. | Nomenclature Avionics                               | OFF            |            | TPF     |                      |                     |                  |                 |                 |     |  |
|--------|---|----------------|------------|---------|----------------------|---------------------|------------------|-----------------|-----------------|-----|--|
|        |   | Transfer Aisle | Tug Demate | Airlock | Tug Maint & C/O Area | Adapter Maint & C/O | KS Buildup & C/O | Propellant Load | Offline Support | WTR |  |
| A-001  | Electrical Power Supply                             |                | x          | x       | x                    |                     | x                |                 |                 | x   |  |
| A-002  | Electrical Power Test Set                           |                |            |         | x                    |                     | x                |                 |                 |     |  |
| A-003  | Electrical Load Banks                               |                |            |         | x                    |                     | x                |                 |                 |     |  |
| A-004  | Battery Test Set                                    |                |            |         |                      |                     |                  |                 | x               |     |  |
| A-005  | Battery Charger                                     |                |            |         | x                    |                     |                  |                 |                 | x   |  |
| A-006  | Communication Test and Checkout Equipment           |                |            |         | x                    |                     | x                |                 |                 |     |  |
| A-007  | Guidance and Navigation Test and Checkout Equipment |                |            |         | x                    |                     | x                |                 |                 |     |  |
| A-008  | Control and Data Acquisition Console                |                |            | x       | x                    |                     | x                |                 |                 | x   |  |
| A-009  | Memory Load and Verify Unit                         |                |            |         | x                    |                     | x                |                 |                 | x   |  |
| A-010  | Electronics Calibration Equipment                   |                |            |         | x                    |                     |                  |                 |                 |     |  |
| A-011  | Orbiter Cable Simulator                             |                |            |         | x                    |                     |                  |                 |                 | x   |  |
| A-012  | Umbilical Simulator                                 |                |            |         | x                    |                     |                  |                 |                 | x   |  |
| A-013  | Star Sensor Simulator                               |                |            |         | x                    |                     | x                |                 |                 |     |  |
| A-014  | Tug/Spacecraft Simulator                            |                |            |         |                      | x                   |                  |                 |                 |     |  |
| A-015  | Fuel Cell Dummy Load Unit                           |                |            |         |                      |                     |                  |                 | x               |     |  |
| A-016  | Ordnance Event Verification Cables                  |                |            |         | x                    |                     |                  |                 |                 | x   |  |
| A-017  | Latch Mechanism Test Set                            |                |            |         | x                    |                     |                  |                 |                 |     |  |
| A-018  | Hardware Interface Module (HIM)                     |                |            |         | x                    |                     |                  |                 |                 | x   |  |

Table 3 (cont)

| ID No. | Handling and Transportation                 | Transfer Aisle | Tug Demate | Airlock | Tug Maint & C/O Area | Adapter Maint & C/O | KS Buildup & C/O | Propellant Load | Offline Support | WTR |
|--------|---|----------------|------------|---------|----------------------|---------------------|------------------|-----------------|-----------------|-----|
| H-001  | Tug Workstand                               |                |            | x       | x                    |                     |                  |                 |                 | x   |
| H-002  | Engine Workstand                            |                |            |         |                      |                     |                  |                 | x               |     |
| H-003  | Deployment Adapter Workstand                |                |            | x       |                      | x                   |                  |                 |                 |     |
| H-004  | Tug Transportation Dolly                    |                |            | x       | x                    |                     |                  |                 |                 |     |
| H-005  | Cargo Bay Work Platform Set                 | x              |            |         |                      |                     |                  |                 |                 | x   |
| H-006  | Internal Platform                           |                |            | x       | x                    |                     |                  |                 |                 |     |
| H-007  | Deployment Adapter Dolly                    |                |            | x       |                      |                     |                  |                 |                 |     |
| H-008  | Deployment Adapter Protective Cover Kit     |                |            |         |                      |                     |                  |                 | x               |     |
| H-009  | Spacecraft Adapter Transport/Storage Pallet |                |            | x       | x                    |                     |                  |                 |                 |     |
| H-010  | Kick Stage Protective Cover Kit             |                |            | x       |                      |                     |                  |                 |                 |     |
| H-011  | Kick Stage Motor Cradle                     |                |            | x       |                      |                     |                  |                 |                 |     |
| H-012  | Kick Stage Buildup/Checkout Fixture         |                |            |         |                      |                     | x                |                 |                 |     |
| H-013  | Kick Stage SRM Storage Pallet               |                |            |         |                      |                     |                  |                 | x               |     |
| H-014  | Kick Stage Storage Pallet                   |                |            |         |                      |                     |                  |                 | x               |     |
| H-015  | Tug Storage Pallet                          |                |            |         |                      |                     |                  |                 | x               |     |
| H-016  | Tug Engine Handling Kit                     |                |            |         |                      |                     |                  |                 | x               |     |
| H-017  | Deployment Adapter Storage Pallet           |                |            |         |                      |                     |                  |                 | x               |     |
| H-018  | Handling Sling Kit                          | x              |            | x       | x                    |                     | x                |                 |                 | x   |
| H-019  | Tug Protective Cover Kit                    |                | x          |         |                      |                     |                  |                 |                 | x   |
| H-020  | Tug Desiccant Kit                           |                |            |         |                      |                     |                  |                 | x               |     |
| H-021  | Battery Handling Kit                        |                |            | x       | x                    |                     |                  |                 |                 | x   |
| H-022  | Air Carry Tie Down Kit                      |                |            |         |                      |                     |                  |                 | x               | x   |
| H-023  | Transport Data Recorder                     |                |            |         |                      |                     |                  |                 | x               |     |
| H-024  | Tug Transtainer                             | x              |            | x       | x                    |                     |                  |                 |                 | x   |
| H-025  | Tug Lifting Rings                           | x              |            | x       | x                    |                     |                  |                 |                 | x   |
| H-026  | Inspection Workstands                       |                | x          | x       | x                    |                     |                  |                 |                 | x   |
| H-027  | Spacecraft Docking Simulator                |                |            |         | x                    |                     |                  |                 |                 |     |
| H-028  | Kick Stage Transtainer                      |                |            |         |                      |                     | x                |                 |                 |     |
| H-029  | Vertical Adapter                            |                |            |         |                      |                     |                  |                 |                 | x   |
| H-030  | Kick Stage Motor Support Fixture            |                |            | x       |                      |                     |                  |                 |                 |     |

Table 3 (concl)

| ID No. | Propulsion and Mechanical                         | Transfer Aisle | Tug Demate | Airlock | Tug Maint & C/O Area | Adapter Maint & C/O | KS Buildup & C/O | Propellant Load | Offline Support | WTR |
|--------|---|----------------|------------|---------|----------------------|---------------------|------------------|-----------------|-----------------|-----|
| P-001  | Aft Umbilical Servicing Unit                      |                |            |         |                      |                     |                  |                 | x               | x   |
| P-002  | Fuel Cell GN <sub>2</sub> Purge Unit              |                |            | x       |                      |                     |                  |                 |                 | x   |
| P-003  | Fuel Cell Water Supply Unit                       |                |            |         |                      |                     |                  |                 | x               |     |
| P-004  | Fuel Cell GH <sub>2</sub> Accumulator Charge Unit |                |            |         |                      |                     |                  |                 | x               |     |
| P-005  | Fuel Cell GO <sub>2</sub> Accumulator Charge Unit |                |            |         |                      |                     |                  |                 | x               |     |
| P-006  | Engine Alingment Kit                              |                |            |         | x                    |                     |                  |                 |                 |     |
| P-007  | Tug Engine Actuator Servicing Kit                 |                |            |         |                      |                     |                  |                 | x               |     |
| P-008  | Alignment Kit                                     |                |            |         | x                    |                     |                  |                 |                 |     |
| P-009  | Insulation Purge and Metering Unit                |                |            | x       | x                    |                     |                  |                 | x               | x   |
| P-010  | Propellant Supply and Transfer Unit               |                |            |         |                      |                     |                  |                 | x               |     |
| P-011  | APS Propellant Control Set                        |                |            | x       | x                    |                     | x                | x               |                 | x   |
| P-012  | APS Propellant Supply and Transfer Unit           |                |            |         |                      |                     |                  |                 | x               | x   |
| P-013  | Preservation Unit                                 |                |            |         |                      |                     |                  |                 | x               |     |
| P-014  | Vacuum Pump and Gauge Unit                        |                |            |         | x                    |                     |                  |                 |                 |     |
| P-015  | Hydraulic Servicer                                |                |            |         | x                    |                     |                  |                 |                 |     |
| P-016  | Pressurization Control Set                        |                |            | x       | x                    | x                   |                  | x               |                 | x   |
| P-017  | Decontamination Unit APS                          |                |            |         |                      |                     |                  |                 | x               |     |
| P-018  | Vacuum Pump and Gauge Unit APS                    |                |            |         |                      |                     |                  | x               |                 | x   |
| P-019  | Thermal Control Servicing Set                     |                |            |         |                      | x                   |                  |                 |                 |     |
| P-020  | Hot GN <sub>2</sub> Purge Unit                    |                |            |         |                      | x                   |                  |                 |                 |     |
|        | <u>Structural</u>                                 |                |            |         |                      |                     |                  |                 |                 |     |
| S-001  | Ultrasonic Scan Unit                              |                |            |         |                      | x                   |                  |                 |                 |     |
| S-002  | Radiography Unit                                  |                |            |         |                      | x                   |                  |                 |                 |     |



*Figure 10 Canister Transporter*

- 2) Environmental control of the canister during transport;
- 3) Swing-open door entry and through-the-top access;
- 4) Capability of sealing the entrance against the TPF cell door opening and at the PCR.
- 5) Self-leveling of the transporter during the ascent of the launch pad ramp at ETR.

1.3.2 Tug Transportation - The Tug peculiar transportation requirements are described in detail in the GSE Requirement Specification Data Sheets in Appendix B, Col. II, Part III. These requirements can be summarized as follows:

- 1) A Tug transtainer for transport to and from the aircraft, with provision for maintaining a clean environment when shipping a checked-out Tug from ETR to WTR;
- 2) A kick stage transtainer;
- 3) A spacecraft transport vehicle (provided as a spacecraft-peculiar requirement).

Transportation of the Tug and major ship-separate subassemblies from the supplier to ETR will be by air, with the Tug horizontal. There are no requirements for keeping the Tug vertical during transportation.

#### 1.4 Site Activation and Verification

The principal activities identified with Tug design/construction at ETR and WTR are shown in Figure 11. The following activities are critical in achieving orderly activation and are considered appropriate in the DDT&E cost estimates contained herein:

- 1) Facility criteria and design development;
- 2) Facility construction and validation;
- 3) GSE criteria and design development;
- 4) GSE construction and validation;
- 5) GSE installation and checkout;
- 6) Functional checkout of the facility and GSE using and engineering model Space Tug.
- 7) Checkout and launch of the first flight article.

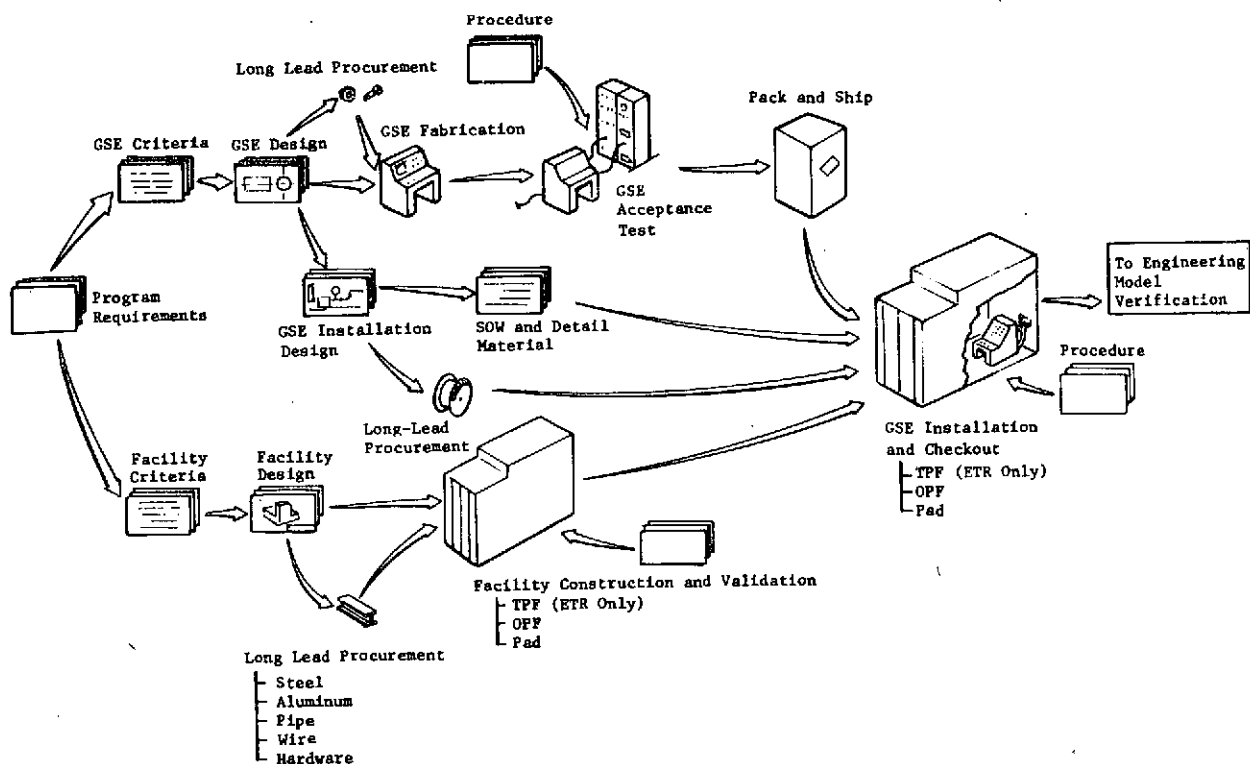


Figure 11 Design Construction Flow, Site Activation

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The functional flow diagram shown in Figure III-D-31, Vol. II, Part I, shows in detail the sequence and interrelationship of these activities.

## 2.0 Manpower Staffing

The Tug site activation phase can be divided as follows:

- 1) Planning, design, and construction;
- 2) Facility/GSE verification with a Tug engineering model;
- 3) Processing, checkout, and launch of the first flight article.

The manpower staffing during the activation period is based on the requirements through these phases, resulting in gradual buildup from a skeleton force to a full operational crew.

For purposes of organizational responsibility, the activation phase essentially consists of a facility/GSE construction period and a vehicle utilization period. The construction period covers activities from facility/GSE criteria development through construction, and validation of the facility/GSE installations. The proposed organization during the construction period for ETR is shown in Figure 12. The manpower buildup during the transition to the vehicle utilization period will occur on completion of the construction/installation validation effort. It is anticipated that the transition will be smooth because personnel used in the first period will now have support functions in the second period. The proposed organization during the vehicle utilization period at ETR is shown in Figure 13. The detailed manpower buildup during this period (through launch of the first flight article) is shown in Tables 4 and 5. It should be noted that the WTR launch crew is included in the total.

The construction phase milestones are shown in Figure 14. Construction phase schedule are displayed in Figure 15. The 1983 schedule for the processing of the engineering model and the flight article at ETR is shown in Figure 16. These schedules were used to form the basis of manpower requirements for the DDT&E phase.

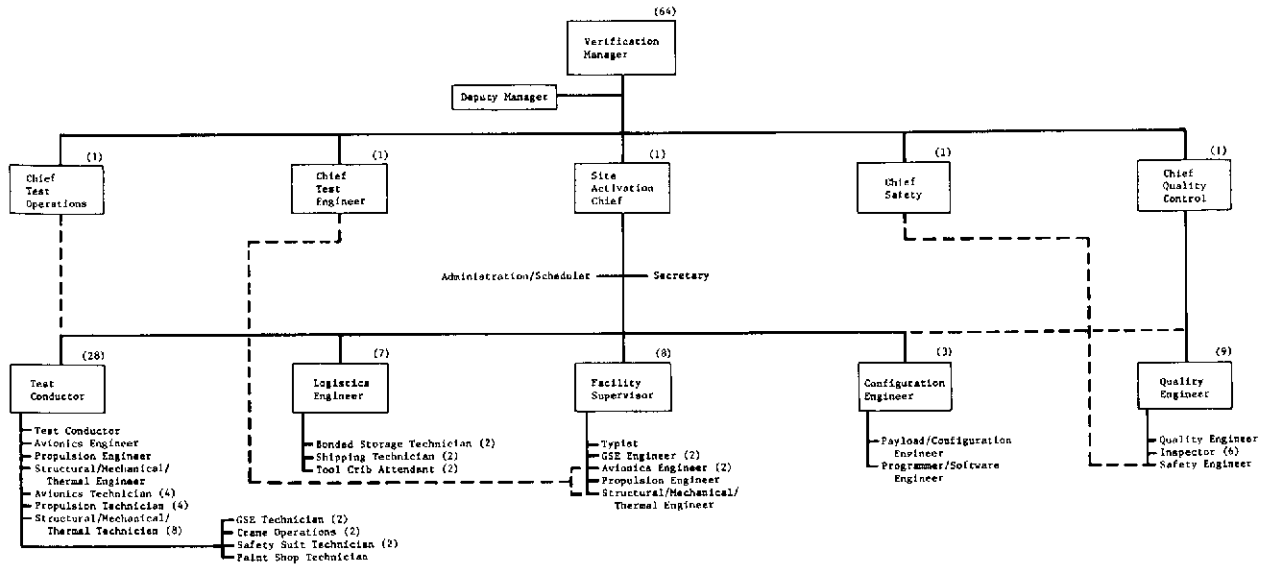


Figure 12 ETR Site Activation, Construction Crew Size

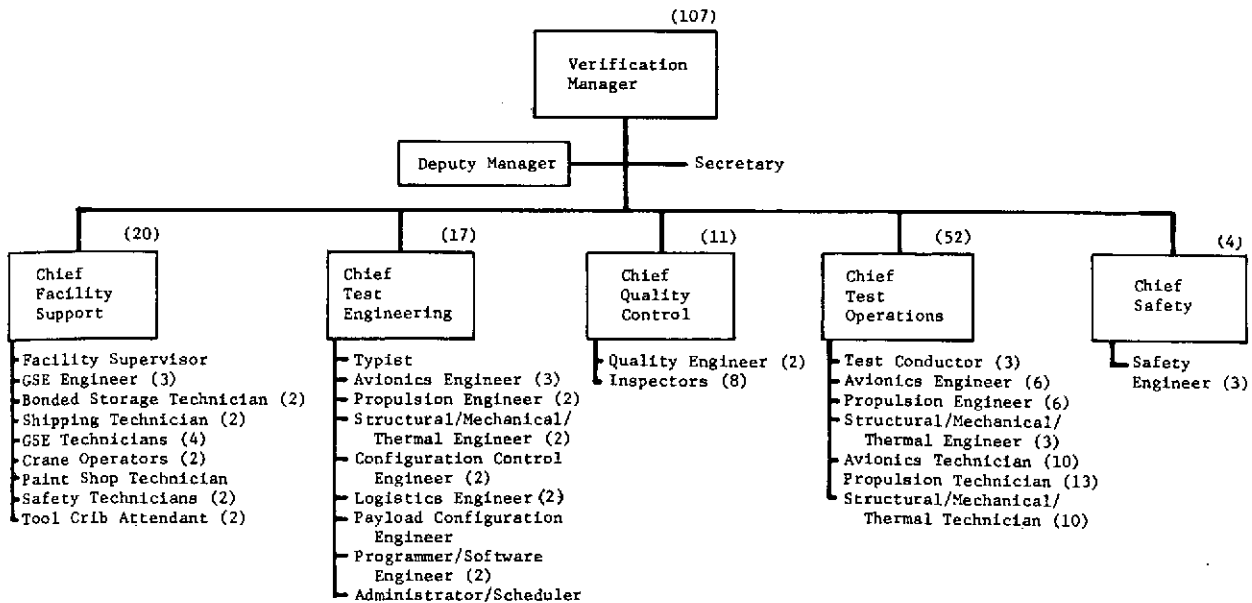


Figure 13 ETR Launch Site Operations Crew Size

|                          | 1980 |    |    |    |    |    |    |    |    |    |    |    | 1981 |    |    |    |    |    |    |    |    |    |    |    | 1982 |    |    |    |    |    |    |    |    |    |    |    |    |    |
|--------------------------|------|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Description              | J    | F  | M  | A  | M  | J  | J  | A  | S  | O  | N  | D  | J    | F  | M  | A  | M  | J  | J  | A  | S  | O  | N  | D  | J    | F  | M  | A  | M  | J  | J  | A  | S  | O  | N  | D  |    |    |
| Activation Chief         | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |    |
| Administration/Scheduler | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |    |
| Secretary/Typist         | 1    | 1  | 1  | 1  | 1  | 1  | 2  | 2  | 2  | 2  | 2  | 2  | 2    | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2    | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  |    |
| Facility Supervisor      | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |    |    |
| Engineers                | 2    | 2  | 2  | 2  | 2  | 2  | 4  | 4  | 4  | 4  | 4  | 6  | 6    | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6    | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  |    |    |
| Test Conductor           |      |    |    |    |    |    | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 2    | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  |    |
| Engineers                |      |    |    |    |    |    | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 2  | 2  | 2  | 3  | 3  | 3  | 3  | 3  | 3    | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  |    |
| Technicians              |      |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |    |    |    | 2  | 2    | 2  | 3  | 3  | 3  | 11 | 11 | 11 | 22 | 22 | 22 | 23 | 23 | 23 |
| Logistics Engineer       | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |    |    |
| Technicians              |      |    |    |    |    |    | 1  | 1  | 1  | 1  | 1  | 2  | 2    | 2  | 2  | 2  | 4  | 4  | 4  | 4  | 4  | 4  | 4  | 4  | 5    | 5  | 5  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  |    |
| Configuration Engineer   | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |    |    |
| Engineers                |      |    |    |    |    |    | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2    | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  |    |    |
| Quality Control Chief    | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |    |    |
| Engineers                |      |    |    |    |    |    | 1  | 1  | 1  | 2  | 2  | 2  | 2    | 2  | 2  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3    | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  |    |
| Inspectors               |      |    |    |    |    |    | 1  | 1  | 1  | 1  | 1  | 2  | 2    | 2  | 2  | 2  | 4  | 4  | 4  | 4  | 4  | 4  | 4  | 4  | 5    | 5  | 5  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  | 6  |    |
| Subtotal                 | 9    | 9  | 9  | 10 | 10 | 10 | 19 | 19 | 19 | 19 | 19 | 23 | 23   | 23 | 23 | 23 | 32 | 32 | 32 | 34 | 34 | 34 | 34 | 45 | 45   | 45 | 58 | 58 | 58 | 59 | 59 | 59 | 59 | 59 | 59 | 59 |    |    |
| Verification Manager     | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |    |    |
| Deputy Manager           |      |    |    |    |    |    |    |    |    |    |    | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |    |    |
| Chief Test Operations    |      |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Chief Test Engineering   |      |    |    |    |    |    |    |    |    |    |    | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |    |    |
| Chief Safety             |      |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Subtotal                 | 1    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 3  | 3    | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 5    | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 5  |    |
| Total                    | 10   | 10 | 10 | 11 | 11 | 11 | 20 | 20 | 20 | 20 | 20 | 26 | 26   | 26 | 26 | 26 | 35 | 35 | 35 | 37 | 37 | 37 | 37 | 50 | 50   | 50 | 63 | 63 | 63 | 64 | 64 | 64 | 64 | 64 | 64 | 64 |    |    |

Table 4 ETR Site Activation, Construction Period

| Manpower Control        |      |   |   |   |   |   |   |   |   |   |   |   |   |
|-------------------------|------|---|---|---|---|---|---|---|---|---|---|---|---|
| Description             | 1982 |   |   |   |   |   |   |   |   |   |   |   |   |
|                         | J    | F | M | A | M | J | J | A | S | O | N | D |   |
| Verification Manager    |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Deputy Manager          |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Secretary/Typist        |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Chief Facility Support  |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Facility Supervisor     |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Engineers               |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Technicians             |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Chief Test Engineering  |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Engineers               |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Administrator/Scheduler |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Chief Quality Control   |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Quality Engineers       |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Inspectors              |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Chief Test Operations   |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Test Conductor          |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Engineers               | 4    | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Technicians             |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Chief Safety            |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Safety Engineers        |      |   |   |   |   |   |   |   |   |   |   |   |   |
| Total                   | 4    | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

Table 5 ETR Site Activation, Engineering Model and First Flight Article

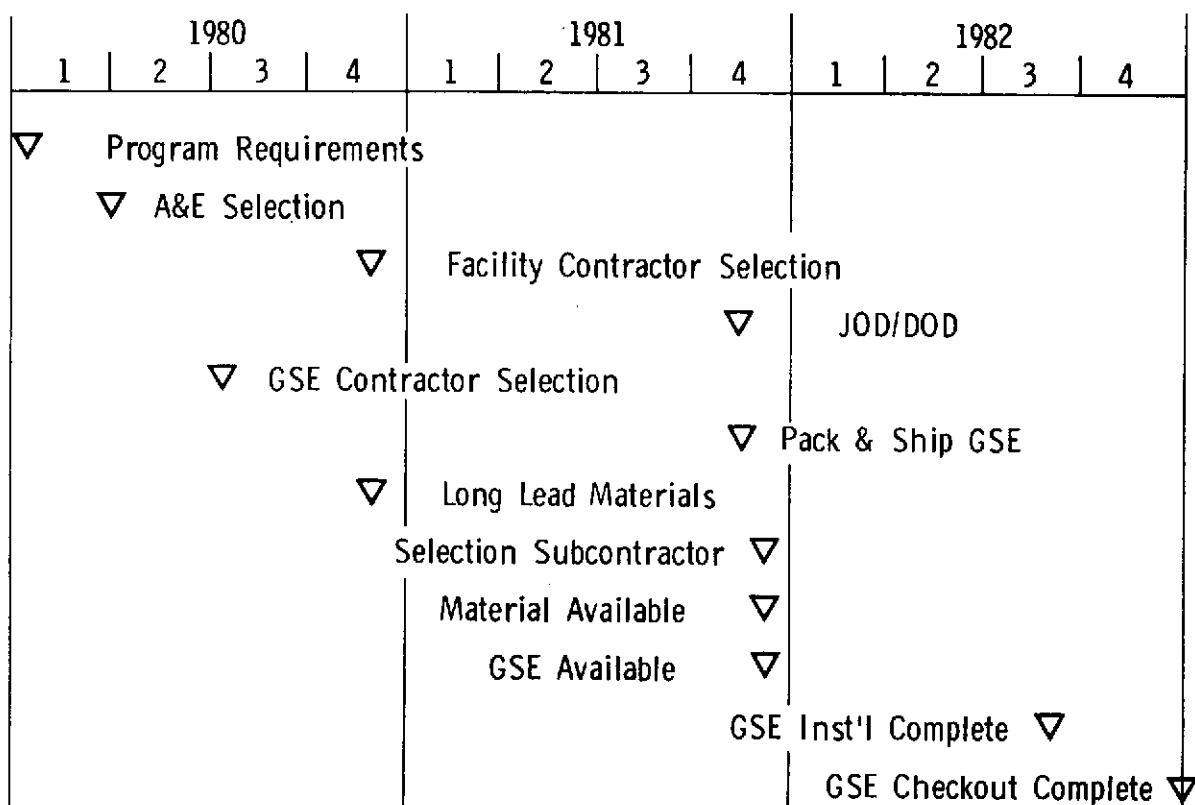


Figure 14 Construction Phase Milestones

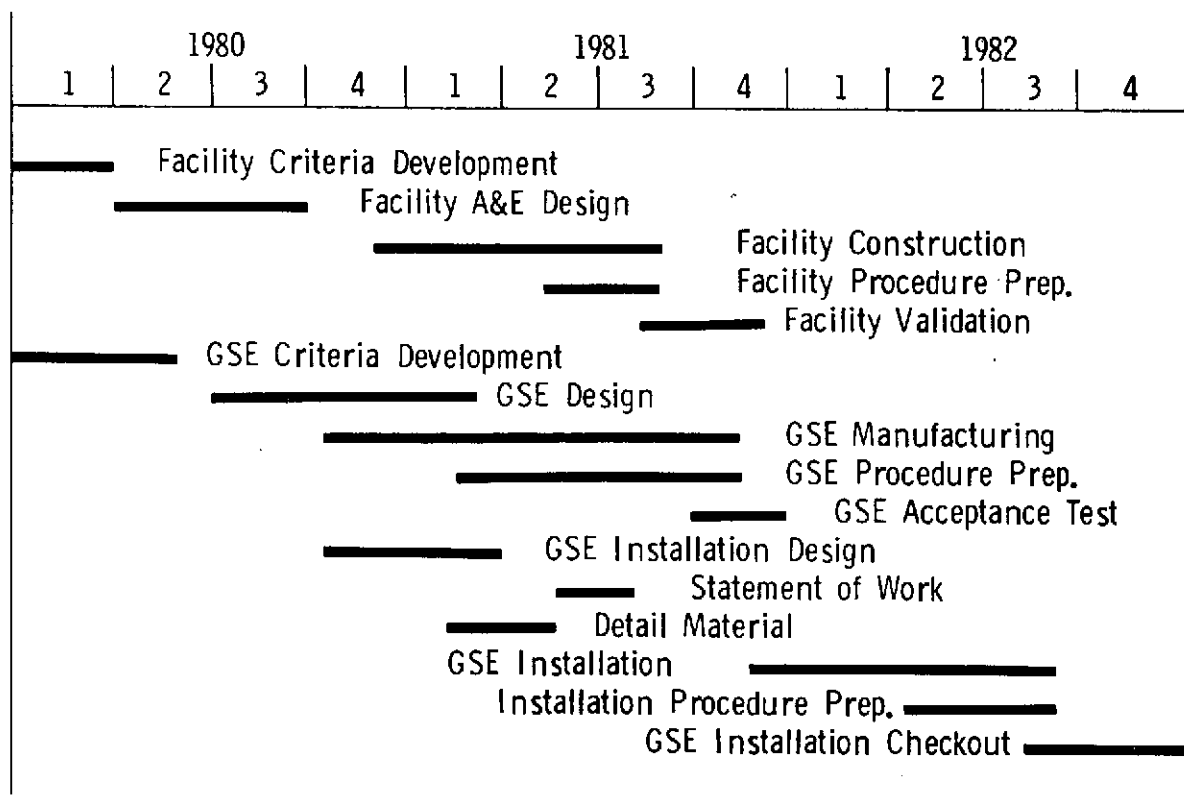


Figure 15 Construction Phase Schedule

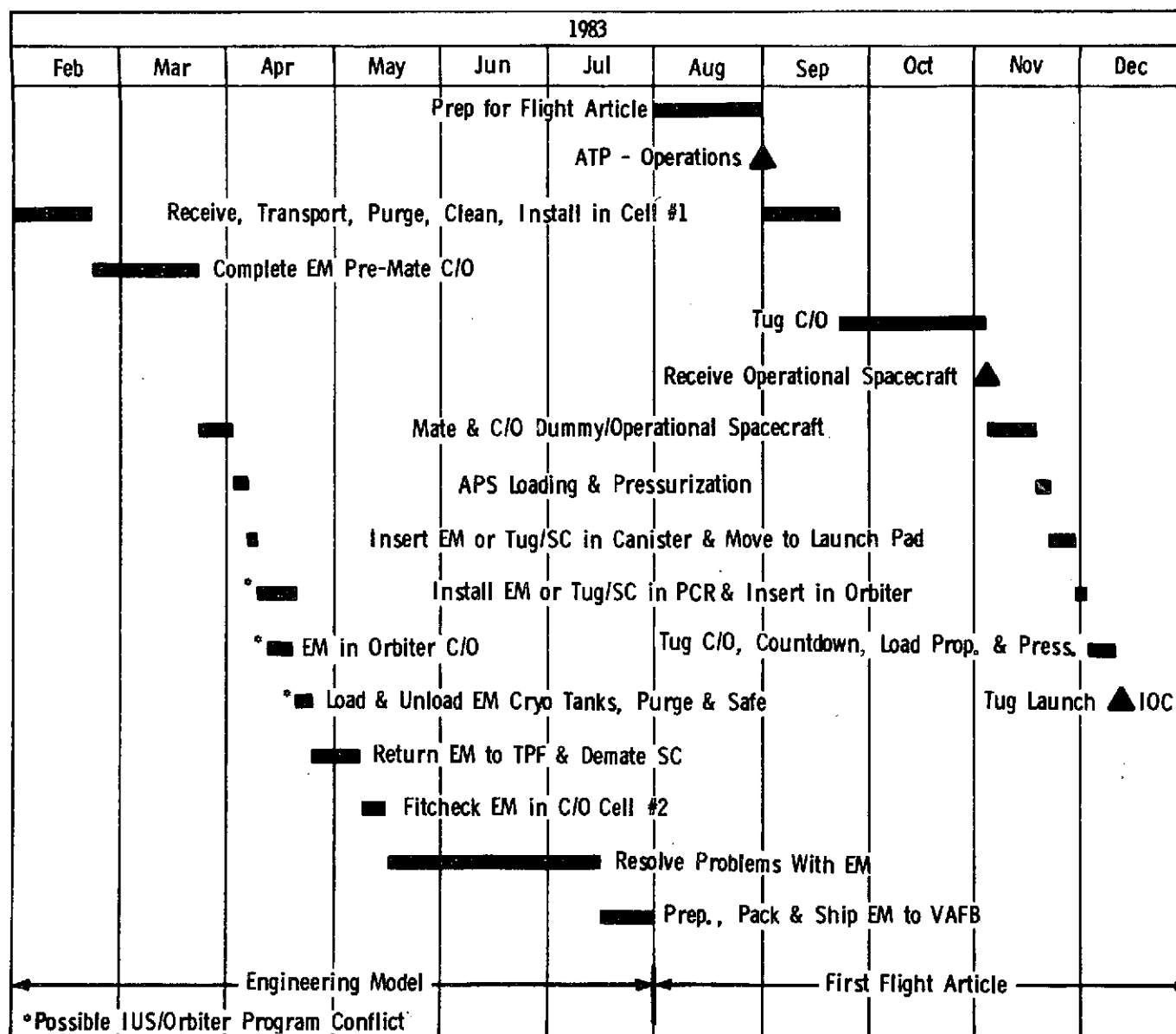


Figure 16 Engineering Model and First Flight Article Schedule

## II. DDT&E LAUNCH SITE ACTIVATION - TIMELINE FUNDING

## II. DDT&E TUG LAUNCH SITE ACTIVATION - TIMELINE FUNDING

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Tug DDT&E phase funding for the factory clean processing option shown in the following tabulated data reflects the cost of Tug unique ground support equipment including LPS equipment at ETR and WTR. Included in the cost of GSE is the additional Kick Stage GSE necessary.

Also included are VAB facility modification for Tug, IUS, and Kick Stage processing areas, the construction of a warehouse facility at ETR, launch pad modifications at ETR, and Orbiter processing facility modifications.

The manpower at each site is phased to reflect the program needs throughout the DDT&E phase. Tug fleet utilization project management office is phased from about six people in 1980 to a full staff in 1983. ETR manpower, as shown in the Tabulated Manpower Summary, shows a rise in manpower from 10 in 1980 to full complement by mid-1983. The WTR staffing reflects the smaller effort early in the program rising to its full line staff of seven in mid-1983. WTR personnel increase after July 1983 reflect the KSC crew of 34 used to check out the first test article and the first Tug vehicle scheduled for launch in early 1984. The costs summarized in Figure 17 are total costs of the related WBS items for the DDT&E. Elements common to the operations phase, such as launch operations and refurbishment and integration, were not included in the DDT&E phase. The additional costs of the processing of the test article and first vehicle checkout before launch were distributed into the DDT&E phase WBS elements, because the study ground rule included the first flight article in DDT&E costs.

|                                     |                 |         |
|-------------------------------------|-----------------|---------|
| Tug Fleet Utilization Project       |                 | \$7.61  |
| Project Management                  | \$2.43          |         |
| Systems Engineering and Integration | 2.49            |         |
| Logistics                           | 1.01            |         |
| Software                            | 1.68            |         |
| Ground and Launch Operations, ETR   |                 | 23.93   |
| Site Management                     | 1.28            |         |
| Facilities                          | 11.89           |         |
| GSE                                 | 10.76           |         |
| Ground and Launch Operations, WTR   |                 | 5.00    |
| Site Management                     | .08             |         |
| Facilities                          | 2.99            |         |
| GSE                                 | 1.93            |         |
|                                     | <u>        </u> |         |
|                                     | Total Cost      | \$36.54 |

Figure 17 DDT&E Phase Costs 1980-1984



A summary of the DDT&E time line funding is shown in Table 6. Detailed information is contained in the tabulated data in this section.

*Table 6 Ground DDT&E Timeline Funding*

| Function                                | 1980 | 1981 | 1982 | 1983  | Total |
|---|------|------|------|-------|-------|
| Fleet Utilization<br>Project Management | 0.26 | 0.50 | 2.07 | 4.78  | 7.61  |
| Ground and Launch<br>Operations, ETR    | 0.62 | 1.19 | 2.47 | 19.67 | 23.95 |
| Ground and Launch<br>Operations, WTR    | --   | 0.50 | 2.52 | 1.96  | 4.98  |
| DDT&E Phase Total                       | 0.88 | 2.19 | 7.06 | 26.41 | 36.54 |

The data shown on the following tabulated formats shows the DDT&E cost at the WBS levels shown in Figure 2. The costs are shown on a monthly basis and breakout the manpower from equipment costs and show the manpower time phasing and its effect on the cost of DDT&E. Detailed definitions of the WBS items are found in the dictionary in Section IV.

## DDT&E - Total Cost Summary By WBS Element

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
TOTAL COST SUMMARY BY WBS ELEMENT

| WBS ELEMENT | DESCRIPTION                        | TOTAL         |
|-------------|------------------------------------|---------------|
| 2A          | DDT&E (GROUND OPERATIONS)          | \$ 36,541,776 |
| 2A.1A       | TUG FLEET UTILIZATION/PROJECT MGMT | 7,604,216     |
| 2A.1A.01    | PROJECT MANAGEMENT                 | 2,425,764     |
| 2A.1A.01.01 | COST/PERFORMANCE MANAGEMENT        | 568,224       |
| 2A.1A.01.02 | PROJECT DIRECTION                  | 524,448       |
| 2A.1A.01.03 | INFORMATION MANAGEMENT             | 502,656       |
| 2A.1A.01.04 | FLEET UTILIZATION                  | 830,436       |
| 2A.1A.02    | SYSTEMS ENGINEERING & INTEGRATION  | 2,491,296     |
| 2A.1A.02.01 | TUG SYSTEMS ENGINEERING            | 480,768       |
| 2A.1A.02.04 | SUSTAINING ENGINEERING             | 2,010,528     |
| 2A.1A.05    | LOGISTICS                          | 1,005,264     |
| 2A.1A.05.02 | TRAINING                           | 699,312       |
| 2A.1A.05.03 | INVENTORY CONTROL & WAREHOUSING    | 262,248       |
| 2A.1A.05.04 | DEPOT MAINTENANCE                  | 43,704        |
| 2A.1A.15    | SOFTWARE                           | 1,681,892     |
| 2A.1A.15.03 | GSE SOFTWARE                       | 1,681,892     |
| 2A.1B       | GROUND & LAUNCH OPERATIONS - ETR   | 23,944,576    |
| 2A.1B.01    | SITE MANAGEMENT (ETR)              | 1,284,071     |
| 2A.1B.01.02 | PROJECT MANAGEMENT                 | 1,166,226     |
| 2A.1B.01.03 | INFORMATION MANAGEMENT             | 117,845       |
| 2A.1B.06    | FACILITIES - ETR                   | 11,896,730    |

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DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
TOTAL COST SUMMARY BY WBS ELEMENT

| WBS ELEMENT    | DESCRIPTION                      | TOTAL                |
|----------------|----------------------------------|----------------------|
| 2A.1B.06.03    | ETR MAINTENANCE & REFURBISHMENT  | \$ 11,818,730        |
| 2A.1B.06.04    | ETR LAUNCH                       | 78,000               |
| 2A.1B.07       | GROUND SUPPORT EQUIPMENT - ETR   | 10,763,775           |
| 2A.1B.07.02    | EASTERN TEST RANGE GSE           | 10,763,775           |
| 2A.1C          | GROUND & LAUNCH OPERATIONS - WTR | 4,992,984            |
| 2A.1C.01       | SITE MANAGEMENT (WTR)            | 75,756               |
| 2A.1C.01.02    | PROJECT MANAGEMENT               | 37,878               |
| 2A.1C.01.03    | INFORMATION MANAGEMENT           | 37,878               |
| 2A.1C.06       | FACILITIES - WTR                 | 2,991,304            |
| 2A.1C.06.05    | WTR MAINTENANCE & REFURBISHMENT  | 2,972,380            |
| 2A.1C.06.08    | FACILITY OPERATIONS SUPPORT      | 18,924               |
| 2A.1C.07       | GROUND SUPPORT EQUIPMENT - WTR   | 1,925,924            |
| 2A.1C.07.03    | WESTERN TEST RANGE GSE           | 1,925,924            |
| PROPOSAL TOTAL |                                  | \$ <u>36,541,776</u> |

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DDT&E - DDT&E Total Cost By Month

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
DDT&E TOTAL COST BY MONTH

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/80 | 15.6       | 2,558     | 22,589     | 26,979        | 279           | 12,963            |     | 1,763 | 64,573       | 64,573            |
| 02/80 | 15.6       | 2,558     | 22,589     | 26,979        | 279           | 2,403             |     |       | 52,250       | 116,823           |
| 03/80 | 15.6       | 2,558     | 22,589     | 26,979        | 279           | 2,403             |     |       | 52,250       | 169,073           |
| 04/80 | 16.6       | 2,722     | 23,912     | 28,648        | 306           | 2,569             |     |       | 55,435       | 224,508           |
| 05/80 | 16.6       | 2,722     | 23,912     | 28,648        | 306           | 2,569             |     |       | 55,435       | 279,943           |
| 06/80 | 16.6       | 2,722     | 23,912     | 28,648        | 306           | 2,569             |     |       | 55,435       | 335,378           |
| 07/80 | 26.6       | 4,362     | 37,147     | 45,338        | 585           | 4,229             |     |       | 87,299       | 422,677           |
| 08/80 | 26.6       | 4,362     | 37,147     | 45,338        | 585           | 4,229             |     |       | 87,299       | 509,976           |
| 09/80 | 26.6       | 4,362     | 37,147     | 45,338        | 585           | 4,229             |     |       | 87,299       | 597,275           |
| 10/80 | 26.6       | 4,362     | 37,147     | 45,338        | 585           | 4,229             |     |       | 87,299       | 684,574           |
| 11/80 | 26.6       | 4,362     | 37,147     | 45,338        | 585           | 4,229             |     |       | 87,299       | 771,873           |
| 12/80 | 31.6       | 5,182     | 43,764     | 53,685        | 725           | 5,058             |     |       | 103,232      | 875,105           |
| TOTAL | 261.2      | 42,832    | 369,002    | 447,256       | 5,405         | 51,679            |     | 1,763 | 875,105      |                   |
| 01/81 | 37.1       | 6,084     | 52,955     | 63,795        | 500,725       | 16,349            |     | 1,763 | 635,587      | 1,510,692         |
| 02/81 | 37.1       | 6,084     | 52,955     | 63,795        | 725           | 5,789             |     |       | 123,264      | 1,633,956         |
| 03/81 | 37.1       | 6,084     | 52,955     | 63,795        | 725           | 5,789             |     |       | 123,264      | 1,757,220         |
| 04/81 | 37.1       | 6,084     | 52,955     | 63,795        | 725           | 5,789             |     |       | 123,264      | 1,880,484         |
| 05/81 | 37.1       | 6,084     | 52,955     | 63,795        | 725           | 5,789             |     |       | 123,264      | 2,003,748         |
| 06/81 | 37.1       | 6,084     | 52,955     | 63,795        | 725           | 5,789             |     |       | 123,264      | 2,127,012         |
| 07/81 | 46.1       | 7,560     | 64,866     | 78,816        | 976           | 7,283             |     |       | 151,941      | 2,278,953         |
| 08/81 | 46.1       | 7,560     | 64,866     | 78,816        | 976           | 7,283             |     |       | 151,941      | 2,430,894         |
| 09/81 | 46.1       | 7,560     | 64,866     | 78,816        | 976           | 7,283             |     |       | 151,941      | 2,582,835         |
| 10/81 | 48.1       | 7,888     | 67,513     | 82,153        | 1,032         | 7,615             |     |       | 158,313      | 2,741,148         |
| 11/81 | 48.1       | 7,888     | 67,513     | 82,153        | 1,032         | 7,615             |     |       | 158,313      | 2,899,461         |
| 12/81 | 50.1       | 8,216     | 70,160     | 85,488        | 1,088         | 7,946             |     |       | 164,682      | 3,064,143         |
| TOTAL | 507.2      | 83,176    | 717,514    | 869,012       | 510,430       | 90,319            |     | 1,763 | 2,189,038    |                   |
| 01/82 | 101.1      | 16,580    | 150,174    | 176,703       | 2,381,506     | 25,777            |     | 1,763 | 2,735,923    | 5,800,066         |
| 02/82 | 101.1      | 16,580    | 150,174    | 176,703       | 1,506         | 15,217            |     |       | 343,600      | 6,143,666         |
| 03/82 | 101.1      | 16,580    | 150,174    | 176,703       | 1,506         | 15,217            |     |       | 343,600      | 6,487,266         |
| 04/82 | 114.1      | 18,712    | 167,379    | 198,401       | 1,869         | 17,375            |     |       | 385,024      | 6,872,290         |
| 05/82 | 114.1      | 18,712    | 167,379    | 198,401       | 1,869         | 17,375            |     |       | 385,024      | 7,257,314         |
| 06/82 | 114.1      | 18,712    | 167,379    | 198,401       | 1,869         | 17,375            |     |       | 385,024      | 7,642,338         |
| 07/82 | 114.1      | 18,712    | 167,379    | 198,401       | 25,869        | 17,375            |     |       | 409,024      | 8,051,362         |
| 08/82 | 116.1      | 19,040    | 170,026    | 201,741       | 25,924        | 17,708            |     |       | 415,399      | 8,466,761         |
| 09/82 | 116.1      | 19,040    | 170,026    | 201,741       | 25,924        | 17,708            |     |       | 415,399      | 8,882,160         |
| 10/82 | 116.1      | 19,040    | 170,026    | 201,741       | 25,924        | 17,708            |     |       | 415,399      | 9,297,559         |
| 11/82 | 116.1      | 19,040    | 170,026    | 201,741       | 25,924        | 17,708            |     |       | 415,399      | 9,712,958         |
| 12/82 | 116.1      | 19,040    | 170,026    | 201,741       | 25,924        | 17,708            |     |       | 415,399      | 10,128,357        |
| TOTAL | 1,340.2    | 219,788   | 1,970,168  | 2,332,418     | 2,545,614     | 214,251           |     | 1,763 | 7,064,214    |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
DDT&E TOTAL COST BY MONTH

| MO/YR       | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE    | M & A   | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------------|------------|-----------|------------|---------------|---------------|-------------------|--------|---------|--------------|-------------------|
| 01/83       | 144.1      | 23,632    | 216,819    | 253,179       | 12,431,424    | 349,985           |        | 54,869  | 13,306,276   | 23,434,633        |
| 02/83       | 156.1      | 25,600    | 232,701    | 273,208       | 26,259        | 23,416            |        |         | 555,584      | 23,990,217        |
| 03/83       | 156.1      | 25,600    | 232,701    | 273,208       | 26,259        | 23,416            |        |         | 555,584      | 24,545,801        |
| 04/83       | 156.1      | 25,600    | 232,701    | 273,208       | 5,170,759     | 341,416           |        | 53,106  | 6,071,190    | 30,616,991        |
| 05/83       | 156.1      | 25,600    | 232,701    | 273,208       | 26,259        | 23,416            |        |         | 555,584      | 31,172,575        |
| 06/83       | 156.1      | 25,600    | 232,701    | 273,208       | 26,259        | 23,416            |        |         | 555,584      | 31,728,159        |
| 07/83       | 162.1      | 26,584    | 240,641    | 283,038       | 2,427         | 342,412           |        | 53,106  | 921,624      | 32,649,783        |
| 08/83       | 185.1      | 30,356    | 271,081    | 381,422       | 3,068         | 83,718            |        |         | 739,289      | 33,389,072        |
| 09/83       | 185.1      | 30,356    | 271,081    | 354,045       | 3,068         | 58,830            | 16,751 |         | 703,775      | 34,092,847        |
| 10/83       | 185.1      | 30,356    | 271,081    | 354,045       | 3,068         | 376,830           |        | 53,106  | 1,058,130    | 35,150,977        |
| 11/83       | 185.1      | 30,356    | 271,081    | 354,045       | 3,068         | 58,830            |        |         | 687,024      | 35,838,001        |
| 12/83       | 185.1      | 30,356    | 271,081    | 354,045       | 3,068         | 58,830            | 16,751 |         | 703,775      | 36,541,776        |
| TOTAL       | 2,012.2    | 329,996   | 2,976,370  | 3,699,859     | 17,724,986    | 1,764,515         | 33,502 | 214,187 | 26,413,419   |                   |
| PROP. TOTAL | 4,120.8    | 675,792   | 6,033,054  | 7,348,545     | 20,786,435    | 2,120,764         | 33,502 | 219,476 | 36,541,776   |                   |

DDT&E - Cost By Project Function By Year (WBS Level PF)



DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY PROJECT FUNCTION BY YEAR, (WBS LEVEL PF)

NO: 2A.1A  
NAME: TUG FLEET UTILIZATION/PROJECT MGMT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A   | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|---------|--------------|-------------------|
| 1980  | 67.2       | 11,016    | 112,248    | 123,468       |               | 19,488            |     | 1,763   | 256,967      | 256,967           |
| 1981  | 133.2      | 21,840    | 222,540    | 244,788       |               | 28,260            |     | 1,763   | 497,351      | 754,318           |
| 1982  | 565.2      | 92,688    | 944,484    | 1,038,936     |               | 85,644            |     | 1,763   | 2,070,827    | 2,825,145         |
| 1983  | 901.2      | 147,792   | 1,506,000  | 1,656,612     |               | 1,402,272         |     | 214,187 | 4,779,071    | 7,604,216         |

NO: 2A.1B  
NAME: GROUND & LAUNCH OPERATIONS - ETR

|      |       |         |           |           |            |         |  |  |            |            |
|------|-------|---------|-----------|-----------|------------|---------|--|--|------------|------------|
| 1980 | 194.0 | 31,816  | 256,754   | 323,788   | 5,405      | 32,191  |  |  | 618,138    | 618,138    |
| 1981 | 374.0 | 61,336  | 494,974   | 624,224   | 10,430     | 62,059  |  |  | 1,191,687  | 1,809,825  |
| 1982 | 775.0 | 127,100 | 1,025,684 | 1,293,482 | 21,614     | 128,607 |  |  | 2,469,387  | 4,279,212  |
| 1983 | 893.0 | 146,452 | 1,181,859 | 1,490,421 | 16,844,902 | 148,182 |  |  | 19,665,364 | 23,944,576 |

NO: 2A.1C  
NAME: GROUND & LAUNCH OPERATIONS - WTR

|       |         |         |           |           |            |           |        |         |            |           |
|-------|---------|---------|-----------|-----------|------------|-----------|--------|---------|------------|-----------|
| 1981  |         |         |           |           | 500,000    |           |        |         | 500,000    | 500,000   |
| 1982  |         |         |           |           | 2,524,000  |           |        |         | 2,524,000  | 3,024,000 |
| 1983  | 218.0   | 35,752  | 288,511   | 552,826   | 880,084    | 214,061   | 33,502 |         | 1,968,984  | 4,992,984 |
| PROP. |         |         |           |           |            |           |        |         |            |           |
| TOTAL | 4,120.8 | 675,792 | 6,033,054 | 7,348,545 | 20,786,435 | 2,120,764 | 33,502 | 219,476 | 36,541,776 |           |

DDT&E - Cost By Project Function By Year (WBS Level 4)

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY PROJECT FUNCTION BY YEAR (WBS LEVEL 4)

NO: 2A.1A.01  
NAME: PROJECT MANAGEMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 1980  | 66.0       | 10,824    | 110,292    | 121,320       |               | 8,772             |     |       | 240,384      | 240,384           |
| 1981  | 108.0      | 17,712    | 180,480    | 198,528       |               | 14,352            |     |       | 393,360      | 633,744           |
| 1982  | 204.0      | 33,456    | 340,920    | 375,024       |               | 27,096            |     |       | 743,040      | 1,376,784         |
| 1983  | 288.0      | 47,232    | 481,296    | 529,428       |               | 38,256            |     |       | 1,048,980    | 2,425,764         |

NO: 2A.1A.02  
NAME: SYSTEMS ENGINEERING & INTEGRATION

|      |       |        |         |         |  |        |  |  |           |           |
|------|-------|--------|---------|---------|--|--------|--|--|-----------|-----------|
| 1981 | 24.0  | 3,936  | 40,104  | 44,112  |  | 3,192  |  |  | 87,408    | 87,408    |
| 1982 | 264.0 | 43,296 | 441,180 | 485,292 |  | 35,076 |  |  | 961,548   | 1,048,956 |
| 1983 | 396.0 | 64,944 | 661,776 | 727,956 |  | 52,608 |  |  | 1,442,340 | 2,491,296 |

TASK NO: 2A.1A.05  
TASK NAME: LOGISTICS

|      |       |        |         |         |  |        |  |  |         |           |
|------|-------|--------|---------|---------|--|--------|--|--|---------|-----------|
| 1982 | 96.0  | 15,744 | 160,428 | 176,472 |  | 12,756 |  |  | 349,656 | 349,656   |
| 1983 | 180.0 | 29,520 | 300,804 | 330,888 |  | 23,916 |  |  | 655,608 | 1,005,264 |

NO: 2A.1A.15  
NAME: SOFTWARE

|      |      |       |        |        |  |           |  |         |           |           |
|------|------|-------|--------|--------|--|-----------|--|---------|-----------|-----------|
| 1980 | 1.2  | 192   | 1,956  | 2,148  |  | 10,716    |  | 1,763   | 16,583    | 16,583    |
| 1981 | 1.2  | 192   | 1,956  | 2,148  |  | 10,716    |  | 1,763   | 16,583    | 33,166    |
| 1982 | 1.2  | 192   | 1,956  | 2,148  |  | 10,716    |  | 1,763   | 16,583    | 49,749    |
| 1983 | 37.2 | 6,096 | 62,124 | 68,340 |  | 1,287,492 |  | 214,187 | 1,632,143 | 1,681,892 |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY PROJECT FUNCTION BY YEAR (WBS LEVEL 4)

NO: 2A.1B.01  
NAME: SITE MANAGEMENT (ETR)

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C. COST | OTHER DIR CHARGES | GPE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|----------------|-------------------|-----|-------|--------------|-------------------|
| 1980  | 79.0       | 12,956    | 104,553    | 131,856       | 2,200          | 13,114            |     |       | 251,723      | 251,723           |
| 1981  | 96.0       | 15,744    | 127,044    | 160,212       | 2,676          | 15,936            |     |       | 305,868      | 557,591           |
| 1982  | 120.0      | 19,680    | 158,808    | 200,280       | 3,348          | 19,920            |     |       | 382,356      | 939,947           |
| 1983  | 108.0      | 17,712    | 142,932    | 180,252       | 3,012          | 17,928            |     |       | 344,124      | 1,284,071         |

NO: 2A.1B.06  
NAME: FACILITIES - ETR

|      |       |         |         |           |           |         |  |  |           |            |
|------|-------|---------|---------|-----------|-----------|---------|--|--|-----------|------------|
| 1980 | 113.0 | 18,532  | 149,554 | 188,592   | 3,149     | 18,745  |  |  | 360,040   | 360,040    |
| 1981 | 252.0 | 41,328  | 333,519 | 420,597   | 7,026     | 41,808  |  |  | 802,950   | 1,162,990  |
| 1982 | 597.0 | 97,908  | 790,113 | 996,402   | 16,647    | 99,066  |  |  | 1,902,228 | 3,065,218  |
| 1983 | 722.0 | 118,408 | 955,549 | 1,205,029 | 6,551,131 | 119,803 |  |  | 8,831,512 | 11,896,730 |

NO: 2A.1B.07  
NAME: GROUND SUPPORT EQUIPMENT - ETR

|      |      |        |        |         |            |        |  |  |            |            |
|------|------|--------|--------|---------|------------|--------|--|--|------------|------------|
| 1980 | 2.0  | 328    | 2,647  | 3,340   | 56         | 332    |  |  | 6,375      | 6,375      |
| 1981 | 26.0 | 4,264  | 34,411 | 43,415  | 728        | 4,315  |  |  | 82,869     | 89,244     |
| 1982 | 58.0 | 9,512  | 76,763 | 96,800  | 1,619      | 9,621  |  |  | 184,803    | 274,047    |
| 1983 | 63.0 | 10,332 | 83,378 | 105,140 | 10,290,759 | 10,451 |  |  | 10,489,728 | 10,763,775 |

NO: 2A.1C.01  
NAME: SITE MANAGEMENT (WTR)

|      |      |       |        |        |     |       |  |  |        |        |
|------|------|-------|--------|--------|-----|-------|--|--|--------|--------|
| 1983 | 24.0 | 3,936 | 31,764 | 39,336 | 672 | 3,984 |  |  | 75,756 | 75,756 |
|------|------|-------|--------|--------|-----|-------|--|--|--------|--------|

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY PROJECT FUNCTION BY YEAR WBS LEVEL 4

NO: 2A.1C.06  
NAME: FACILITIES - WTR

| MO/YR                                | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE    | M&A     | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|--------------------------------------|------------|-----------|------------|---------------|---------------|-------------------|--------|---------|--------------|-------------------|
| 1981                                 |            |           |            |               | 500,000       |                   |        |         | 500,000      | 500,000           |
| 1982                                 |            |           |            |               | 761,000       |                   |        |         | 761,000      | 1,261,000         |
| 1983                                 | 188.0      | 30,832    | 248,809    | 503,668       | 735,244       | 209,081           | 33,502 |         | 1,730,304    | 2,991,304         |
| NO: 2A.1C.07                         |            |           |            |               |               |                   |        |         |              |                   |
| NAME: GROUND SUPPORT EQUIPMENT - WTR |            |           |            |               |               |                   |        |         |              |                   |
| 1982                                 |            |           |            |               | 1,763,000     |                   |        |         | 1,763,000    | 1,763,000         |
| 1983                                 | 6.0        | 984       | 7,938      | 9,822         | 144,168       | 996               |        |         | 162,924      | 1,925,924         |
| PROP.                                |            |           |            |               |               |                   |        |         |              |                   |
| TOTAL                                | 4,120.8    | 675,792   | 6,033,054  | 7,348,545     | 20,786,435    | 2,120,764         | 33,502 | 219,476 | 36,541,776   |                   |

## DDT&E - Cost By Project Function By Month (WBS Level 5)

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1A.01.01  
NAME: COST/PERFORMANCE MANAGEMENT

42

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-----|--------------|-------------------|
| 01/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 5,464             |
| 02/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 10,928            |
| 03/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 16,392            |
| 04/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 21,856            |
| 05/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 27,320            |
| 06/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 32,784            |
| 07/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 38,248            |
| 08/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 43,712            |
| 09/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 49,176            |
| 10/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 54,640            |
| 11/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 60,104            |
| 12/80 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 65,568            |
| TOTAL | 18.0       | 2,952     | 30,084     | 33,096        |               | 2,388             |     |     | 65,568       |                   |
| 01/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 71,032            |
| 02/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 76,496            |
| 03/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 81,960            |
| 04/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 87,424            |
| 05/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 92,888            |
| 06/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 98,352            |
| 07/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 103,816           |
| 08/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 109,280           |
| 09/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 114,744           |
| 10/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 120,208           |
| 11/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 125,672           |
| 12/81 | 1.5        | 246       | 2,507      | 2,758         |               | 199               |     |     | 5,464        | 131,136           |
| TOTAL | 18.0       | 2,952     | 30,084     | 33,096        |               | 2,388             |     |     | 65,568       |                   |
| 01/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 145,706           |
| 02/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 160,276           |
| 03/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 174,846           |
| 04/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 189,416           |
| 05/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 203,986           |
| 06/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 218,556           |
| 07/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 233,126           |
| 08/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 247,696           |
| 09/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 262,266           |
| 10/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 276,836           |
| 11/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 291,406           |
| 12/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |     | 14,570       | 305,976           |
| TOTAL | 48.0       | 7,872     | 80,220     | 88,248        |               | 6,372             |     |     | 174,840      |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1A.01.01  
NAME: COST/PERFORMANCE MANAGEMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C. COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|----------------|-------------------|-----|-------|--------------|-------------------|
| 01/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 327,830           |
| 02/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 349,684           |
| 03/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 371,538           |
| 04/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 393,392           |
| 05/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 415,246           |
| 06/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 437,100           |
| 07/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 458,954           |
| 08/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 480,808           |
| 09/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 502,662           |
| 10/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 524,516           |
| 11/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 546,370           |
| 12/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 568,224           |
| TOTAL | 72.0       | 11,808    | 120,324    | 132,360       |                | 9,564             |     |       | 262,248      |                   |

TASK NO: 2A.1A.01.02  
TASK NAME: PROJECT DIRECTION

|       |      |       |        |        |  |       |  |  |         |         |
|-------|------|-------|--------|--------|--|-------|--|--|---------|---------|
| 01/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 10,926  |
| 02/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 21,852  |
| 03/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 32,778  |
| 04/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 43,704  |
| 05/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 54,630  |
| 06/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 65,556  |
| 07/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 76,482  |
| 08/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 87,408  |
| 09/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 98,334  |
| 10/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 109,260 |
| 11/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 120,186 |
| 12/80 | 3.0  | 492   | 5,013  | 5,514  |  | 399   |  |  | 10,926  | 131,112 |
| TOTAL | 36.0 | 5,904 | 60,156 | 66,168 |  | 4,788 |  |  | 131,112 |         |

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DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1A.01.02  
NAME: PROJECT DIRECTION

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 142,038           |
| 02/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 152,964           |
| 03/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 163,890           |
| 04/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 174,816           |
| 05/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 185,742           |
| 06/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 196,668           |
| 07/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 207,594           |
| 08/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 218,520           |
| 09/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 229,446           |
| 10/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 240,372           |
| 11/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 251,298           |
| 12/81 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 262,224           |
| TOTAL | 36.0       | 5,904     | 60,156     | 66,168        |               | 4,788             |     |       | 131,112      |                   |
| 01/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 273,150           |
| 02/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 284,076           |
| 03/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 295,002           |
| 04/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 305,928           |
| 05/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 316,854           |
| 06/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 327,780           |
| 07/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 338,706           |
| 08/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 349,632           |
| 09/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 360,558           |
| 10/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 371,484           |
| 11/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 382,410           |
| 12/82 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 393,336           |
| TOTAL | 36.0       | 5,904     | 60,156     | 66,168        |               | 4,788             |     |       | 131,112      |                   |
| 01/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 404,262           |
| 02/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 415,188           |
| 03/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 426,114           |
| 04/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 437,040           |
| 05/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 447,966           |
| 06/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 458,892           |
| 07/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 469,818           |
| 08/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 480,744           |
| 09/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 491,670           |
| 10/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 502,596           |
| 11/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 513,522           |
| 12/83 | 3.0        | 492       | 5,013      | 5,514         |               | 399               |     |       | 10,926       | 524,448           |
| TOTAL | 36.0       | 5,904     | 60,156     | 66,168        |               | 4,788             |     |       | 131,112      |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1A.01.03  
NAME: INFORMATION MANAGEMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 3,642             |
| 02/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 7,284             |
| 03/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 10,926            |
| 04/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 14,568            |
| 05/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 18,210            |
| 06/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 21,852            |
| 07/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 25,494            |
| 08/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 29,136            |
| 09/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 32,778            |
| 10/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 36,420            |
| 11/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 40,062            |
| 12/80 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 43,704            |
| TOTAL | 12.0       | 1,968     | 20,052     | 22,056        |               | 1,596             |     |       | 43,704       |                   |
| 01/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 52,810            |
| 02/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 61,916            |
| 03/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 71,022            |
| 04/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 80,128            |
| 05/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 89,234            |
| 06/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 98,340            |
| 07/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 107,446           |
| 08/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 116,552           |
| 09/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 125,658           |
| 10/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 134,764           |
| 11/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 143,870           |
| 12/81 | 2.5        | 410       | 4,178      | 4,596         |               | 332               |     |       | 9,106        | 152,976           |
| TOTAL | 30.0       | 4,920     | 50,136     | 55,152        |               | 3,984             |     |       | 109,272      |                   |
| 01/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 167,546           |
| 02/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 182,116           |
| 03/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 196,686           |
| 04/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 211,256           |
| 05/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 225,826           |
| 06/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 240,396           |
| 07/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 254,966           |
| 08/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 269,536           |
| 09/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 284,106           |
| 10/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 298,676           |
| 11/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 313,246           |
| 12/82 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 327,816           |
| TOTAL | 48.0       | 7,872     | 80,220     | 88,248        |               | 6,372             |     |       | 174,840      |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1A.01.03  
NAME: INFORMATION MANAGEMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 342,386           |
| 02/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 356,956           |
| 03/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 371,526           |
| 04/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 386,096           |
| 05/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 400,666           |
| 06/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 415,236           |
| 07/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 429,806           |
| 08/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 444,376           |
| 09/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 458,946           |
| 10/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 473,516           |
| 11/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 488,086           |
| 12/83 | 4.0        | 656       | 6,685      | 7,354         |               | 531               |     |       | 14,570       | 502,656           |
| TOTAL | 48.0       | 7,872     | 80,220     | 88,248        |               | 6,372             |     |       | 174,840      |                   |

TASK NO: 2A.1A.01.04  
TASK NAME: FLEET UTILIZATION

|       |      |       |        |        |  |       |  |  |        |        |
|-------|------|-------|--------|--------|--|-------|--|--|--------|--------|
| 01/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 7,284  |
| 02/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 14,568 |
| 03/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 21,852 |
| 04/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 29,136 |
| 05/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 36,420 |
| 06/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 43,704 |
| 07/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 50,988 |
| 08/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 58,272 |
| 09/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 65,556 |
| 10/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 72,840 |
| 11/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 80,124 |
| 12/81 | 2.0  | 328   | 3,342  | 3,676  |  | 266   |  |  | 7,284  | 87,408 |
| TOTAL | 24.0 | 3,936 | 40,104 | 44,112 |  | 3,192 |  |  | 87,408 |        |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1A.01.04  
NAME: FLEET UTILIZATION

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 109,262           |
| 02/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 131,116           |
| 03/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 152,970           |
| 04/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 174,824           |
| 05/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 196,678           |
| 06/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 218,532           |
| 07/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 240,386           |
| 08/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 262,240           |
| 09/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 284,094           |
| 10/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 305,948           |
| 11/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 327,802           |
| 12/82 | 6.0        | 984       | 10,027     | 11,030        |               | 797               |     |       | 21,854       | 349,656           |
| TOTAL | 72.0       | 11,808    | 120,324    | 132,360       |               | 9,564             |     |       | 262,248      |                   |
| 01/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 389,721           |
| 02/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 429,786           |
| 03/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 469,851           |
| 04/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 509,916           |
| 05/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 549,981           |
| 06/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 590,046           |
| 07/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 630,111           |
| 08/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 670,176           |
| 09/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 710,241           |
| 10/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 750,306           |
| 11/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 790,371           |
| 12/83 | 11.0       | 1,804     | 18,383     | 20,221        |               | 1,461             |     |       | 40,065       | 830,436           |
| TOTAL | 132.0      | 21,648    | 220,596    | 242,652       |               | 17,532            |     |       | 480,780      |                   |

DOT&E - TUG LAUNCH SITE ACTIVATION  
732-ROO  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A-1A.02.01  
NAME: TUG SYSTEMS ENGINEERING

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 7,284             |
| 02/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 14,568            |
| 03/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 21,852            |
| 04/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 29,136            |
| 05/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 36,420            |
| 06/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 43,704            |
| 07/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 50,988            |
| 08/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 58,272            |
| 09/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 65,556            |
| 10/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 72,840            |
| 11/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 80,124            |
| 12/82 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 87,408            |
| TOTAL | 24.0       | 3,936     | 40,104     | 44,112        |               | 3,192             |     |       | 87,408       |                   |
| 01/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 120,188           |
| 02/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 152,968           |
| 03/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 185,748           |
| 04/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 218,528           |
| 05/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 251,308           |
| 06/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 284,088           |
| 07/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 316,868           |
| 08/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 349,648           |
| 09/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 382,428           |
| 10/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 415,208           |
| 11/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 447,988           |
| 12/83 | 9.0        | 1,476     | 15,040     | 16,544        |               | 1,196             |     |       | 32,780       | 480,768           |
| TOTAL | 108.0      | 17,712    | 180,480    | 198,528       |               | 14,352            |     |       | 393,360      |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1A.02.04  
NAME: SUSTAINING ENGINEERING

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 7,284             |
| 02/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 14,568            |
| 03/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 21,852            |
| 04/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 29,136            |
| 05/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 36,420            |
| 06/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 43,704            |
| 07/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 50,988            |
| 08/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 58,272            |
| 09/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 65,556            |
| 10/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 72,840            |
| 11/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 80,124            |
| 12/81 | 2.0        | 328       | 3,342      | 3,676         |               | 266               |     |       | 7,284        | 87,408            |
| TOTAL | 24.0       | 3,936     | 40,104     | 44,112        |               | 3,192             |     |       | 87,408       |                   |
| 01/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 160,253           |
| 02/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 233,098           |
| 03/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 305,943           |
| 04/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 378,788           |
| 05/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 451,633           |
| 06/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 524,478           |
| 07/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 597,323           |
| 08/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 670,168           |
| 09/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 743,013           |
| 10/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 815,858           |
| 11/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 888,703           |
| 12/82 | 20.0       | 3,280     | 33,423     | 36,765        |               | 2,657             |     |       | 72,845       | 961,548           |
| TOTAL | 240.0      | 39,360    | 401,076    | 441,180       |               | 31,884            |     |       | 874,140      |                   |
| 01/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 1,048,963         |
| 02/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 1,136,378         |
| 03/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 1,223,793         |
| 04/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 1,311,208         |
| 05/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 1,398,623         |
| 06/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 1,486,038         |
| 07/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 1,573,453         |
| 08/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 1,660,868         |
| 09/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 1,748,283         |
| 10/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 1,835,698         |
| 11/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 1,923,113         |
| 12/83 | 24.0       | 3,936     | 40,108     | 44,119        |               | 3,188             |     |       | 87,415       | 2,010,528         |
| TOTAL | 288.0      | 47,232    | 481,296    | 529,426       |               | 38,256            |     |       | 1,048,980    |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1A.05.02  
NAME: TRAINING

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 29,138            |
| 02/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 58,276            |
| 03/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 87,414            |
| 04/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 116,552           |
| 05/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 145,690           |
| 06/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 174,828           |
| 07/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 203,966           |
| 08/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 233,104           |
| 09/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 262,242           |
| 10/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 291,380           |
| 11/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 320,518           |
| 12/82 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 349,656           |
| TOTAL | 96.0       | 15,744    | 160,428    | 176,472       |               | 12,756            |     |       | 349,656      |                   |
| 01/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 378,794           |
| 02/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 407,932           |
| 03/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 437,070           |
| 04/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 466,208           |
| 05/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 495,346           |
| 06/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 524,484           |
| 07/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 553,622           |
| 08/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 582,760           |
| 09/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 611,898           |
| 10/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 641,036           |
| 11/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 670,174           |
| 12/83 | 8.0        | 1,312     | 13,369     | 14,706        |               | 1,063             |     |       | 29,138       | 699,312           |
| TOTAL | 96.0       | 15,744    | 160,428    | 176,472       |               | 12,756            |     |       | 349,656      |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1A.05.03  
NAME: INVENTORY CONTRL & WAREHOUSING

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C. COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|----------------|-------------------|-----|-------|--------------|-------------------|
| 01/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 21,854            |
| 02/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 43,708            |
| 03/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 65,562            |
| 04/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 87,416            |
| 05/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 109,270           |
| 06/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 131,124           |
| 07/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 152,978           |
| 08/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 174,832           |
| 09/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 196,686           |
| 10/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 218,540           |
| 11/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 240,394           |
| 12/83 | 6.0        | 984       | 10,027     | 11,030        |                | 797               |     |       | 21,854       | 262,248           |
| TOTAL | 72.0       | 11,808    | 120,324    | 132,360       |                | 9,564             |     |       | 262,248      |                   |



DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1A.05.04  
NAME: DEPOT MAINTENANCE

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 3,642             |
| 02/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 7,284             |
| 03/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 10,926            |
| 04/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 14,568            |
| 05/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 18,210            |
| 06/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 21,852            |
| 07/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 25,494            |
| 08/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 29,136            |
| 09/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 32,778            |
| 10/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 36,420            |
| 11/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 40,062            |
| 12/83 | 1.0        | 164       | 1,671      | 1,838         |               | 133               |     |       | 3,642        | 43,704            |
| TOTAL | 12.0       | 1,968     | 20,052     | 22,056        |               | 1,596             |     |       | 43,704       |                   |

NO: 2A.1A.15.03  
NAME: GSE SOFTWARE

|       |     |     |       |       |  |        |  |       |        |        |
|-------|-----|-----|-------|-------|--|--------|--|-------|--------|--------|
| 01/80 | .1  | 16  | 163   | 179   |  | 10,573 |  | 1,763 | 12,678 | 12,678 |
| 02/80 | .1  | 16  | 163   | 179   |  | 13     |  |       | 355    | 13,033 |
| 03/80 | .1  | 16  | 163   | 179   |  | 13     |  |       | 355    | 13,388 |
| 04/80 | .1  | 16  | 163   | 179   |  | 13     |  |       | 355    | 13,743 |
| 05/80 | .1  | 16  | 163   | 179   |  | 13     |  |       | 355    | 14,098 |
| 06/80 | .1  | 16  | 163   | 179   |  | 13     |  |       | 355    | 14,453 |
| 07/80 | .1  | 16  | 163   | 179   |  | 13     |  |       | 355    | 14,808 |
| 08/80 | .1  | 16  | 163   | 179   |  | 13     |  |       | 355    | 15,163 |
| 09/80 | .1  | 16  | 163   | 179   |  | 13     |  |       | 355    | 15,518 |
| 10/80 | .1  | 16  | 163   | 179   |  | 13     |  |       | 355    | 15,873 |
| 11/80 | .1  | 16  | 163   | 179   |  | 13     |  |       | 355    | 16,228 |
| 12/80 | .1  | 16  | 163   | 179   |  | 13     |  |       | 355    | 16,583 |
| TOTAL | 1.2 | 192 | 1,956 | 2,148 |  | 10,716 |  | 1,763 | 16,583 |        |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1A.15.03  
NAME: GSE SOFTWARE

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A   | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|---------|--------------|-------------------|
| 01/81 | .1         | 16        | 163        | 179           |               | 10,573            |     | 1,763   | 12,678       | 29,261            |
| 02/81 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 29,616            |
| 03/81 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 29,971            |
| 04/81 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 30,326            |
| 05/81 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 30,681            |
| 06/81 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 31,036            |
| 07/81 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 31,391            |
| 08/81 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 31,746            |
| 09/81 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 32,101            |
| 10/81 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 32,456            |
| 11/81 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 32,811            |
| 12/81 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 33,166            |
| TOTAL | 1.2        | 192       | 1,956      | 2,148         |               | 10,716            |     | 1,763   | 16,583       |                   |
| 01/82 | .1         | 16        | 163        | 179           |               | 10,573            |     | 1,763   | 12,678       | 45,844            |
| 02/82 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 46,199            |
| 03/82 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 46,554            |
| 04/82 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 46,909            |
| 05/82 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 47,264            |
| 06/82 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 47,619            |
| 07/82 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 47,974            |
| 08/82 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 48,329            |
| 09/82 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 48,684            |
| 10/82 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 49,039            |
| 11/82 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 49,394            |
| 12/82 | .1         | 16        | 163        | 179           |               | 13                |     |         | 355          | 49,749            |
| TOTAL | 1.2        | 192       | 1,956      | 2,148         |               | 10,716            |     | 1,763   | 16,583       |                   |
| 01/83 | 3.1        | 508       | 5,177      | 5,695         |               | 328,971           |     | 54,869  | 394,712      | 444,461           |
| 02/83 | 3.1        | 508       | 5,177      | 5,695         |               | 411               |     |         | 11,283       | 455,744           |
| 03/83 | 3.1        | 508       | 5,177      | 5,695         |               | 411               |     |         | 11,283       | 467,027           |
| 04/83 | 3.1        | 508       | 5,177      | 5,695         |               | 318,411           |     | 53,106  | 382,389      | 849,416           |
| 05/83 | 3.1        | 508       | 5,177      | 5,695         |               | 411               |     |         | 11,283       | 860,699           |
| 06/83 | 3.1        | 508       | 5,177      | 5,695         |               | 411               |     |         | 11,283       | 871,982           |
| 07/83 | 3.1        | 508       | 5,177      | 5,695         |               | 318,411           |     | 53,106  | 382,389      | 1,254,371         |
| 08/83 | 3.1        | 508       | 5,177      | 5,695         |               | 411               |     |         | 11,283       | 1,265,654         |
| 09/83 | 3.1        | 508       | 5,177      | 5,695         |               | 411               |     |         | 11,283       | 1,276,937         |
| 10/83 | 3.1        | 508       | 5,177      | 5,695         |               | 318,411           |     | 53,106  | 382,389      | 1,659,326         |
| 11/83 | 3.1        | 508       | 5,177      | 5,695         |               | 411               |     |         | 11,283       | 1,670,609         |
| 12/83 | 3.1        | 508       | 5,177      | 5,695         |               | 411               |     |         | 11,283       | 1,681,892         |
| TOTAL | 37.2       | 6,096     | 62,124     | 68,340        |               | 1,287,492         |     | 214,187 | 1,632,143    |                   |

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DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1B.01.02  
NAME: PROJECT MANAGEMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/80 | 6.0        | 984       | 7,941      | 10,015        | 167           | 996               |     |       | 19,119       | 19,119            |
| 02/80 | 6.0        | 984       | 7,941      | 10,015        | 167           | 996               |     |       | 19,119       | 38,238            |
| 03/80 | 6.0        | 984       | 7,941      | 10,015        | 167           | 996               |     |       | 19,119       | 57,357            |
| 04/80 | 6.0        | 984       | 7,941      | 10,015        | 167           | 996               |     |       | 19,119       | 76,476            |
| 05/80 | 6.0        | 984       | 7,941      | 10,015        | 167           | 996               |     |       | 19,119       | 95,595            |
| 06/80 | 6.0        | 984       | 7,941      | 10,015        | 167           | 996               |     |       | 19,119       | 114,714           |
| 07/80 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 137,018           |
| 08/80 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 159,322           |
| 09/80 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 181,626           |
| 10/80 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 203,930           |
| 11/80 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 226,234           |
| 12/80 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 248,538           |
| TOTAL | 78.0       | 12,792    | 103,230    | 130,188       | 2,172         | 12,948            |     |       | 248,538      |                   |
| 01/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 270,842           |
| 02/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 293,146           |
| 03/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 315,450           |
| 04/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 337,754           |
| 05/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 360,058           |
| 06/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 382,362           |
| 07/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 404,666           |
| 08/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 426,970           |
| 09/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 449,274           |
| 10/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 471,578           |
| 11/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 493,882           |
| 12/81 | 7.0        | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 516,186           |
| TOTAL | 84.0       | 13,776    | 111,168    | 140,196       | 2,340         | 13,944            |     |       | 267,648      |                   |
| 01/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 544,864           |
| 02/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 573,542           |
| 03/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 602,220           |
| 04/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 630,898           |
| 05/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 659,576           |
| 06/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 688,254           |
| 07/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 716,932           |
| 08/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 745,610           |
| 09/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 774,288           |
| 10/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 802,966           |
| 11/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 831,644           |
| 12/82 | 9.0        | 1,476     | 11,911     | 15,022        | 251           | 1,494             |     |       | 28,678       | 860,322           |
| TOTAL | 108.0      | 17,712    | 142,932    | 180,264       | 3,012         | 17,928            |     |       | 344,136      |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1B.01.02  
NAME: PROJECT MANAGEMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 885,814           |
| 02/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 911,306           |
| 03/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 936,798           |
| 04/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 962,290           |
| 05/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 987,782           |
| 06/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 1,013,274         |
| 07/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 1,038,766         |
| 08/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 1,064,258         |
| 09/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 1,089,750         |
| 10/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 1,115,242         |
| 11/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 1,140,734         |
| 12/83 | 8.0        | 1,312     | 10,588     | 13,353        | 223           | 1,328             |     |       | 25,492       | 1,166,226         |
| TOTAL | 96.0       | 15,744    | 127,056    | 160,236       | 2,676         | 15,936            |     |       | 305,904      |                   |

NO: 2A.1B.01.03  
NAME: INFORMATION MANAGEMENT

|       |     |     |       |       |    |     |  |  |       |       |
|-------|-----|-----|-------|-------|----|-----|--|--|-------|-------|
| 01/80 |     |     |       |       |    |     |  |  |       |       |
| 02/80 |     |     |       |       |    |     |  |  |       |       |
| 03/80 |     |     |       |       |    |     |  |  |       |       |
| 04/80 |     |     |       |       |    |     |  |  |       |       |
| 05/80 |     |     |       |       |    |     |  |  |       |       |
| 06/80 |     |     |       |       |    |     |  |  |       |       |
| 07/80 |     |     |       |       |    |     |  |  |       |       |
| 08/80 |     |     |       |       |    |     |  |  |       |       |
| 09/80 |     |     |       |       |    |     |  |  |       |       |
| 10/80 |     |     |       |       |    |     |  |  |       |       |
| 11/80 |     |     |       |       |    |     |  |  |       |       |
| 12/80 | 1.0 | 164 | 1,323 | 1,668 | 28 | 166 |  |  | 3,185 | 3,185 |
| TOTAL | 1.0 | 164 | 1,323 | 1,668 | 28 | 166 |  |  | 3,185 |       |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1B.01.03  
NAME: INFORMATION MANAGEMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 6,370             |
| 02/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 9,555             |
| 03/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 12,740            |
| 04/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 15,925            |
| 05/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 19,110            |
| 06/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 22,295            |
| 07/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 25,480            |
| 08/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 28,665            |
| 09/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 31,850            |
| 10/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 35,035            |
| 11/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 38,220            |
| 12/81 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 41,405            |
| TOTAL | 12.0       | 1,968     | 15,876     | 20,016        | 336           | 1,992             |     |       | 38,220       |                   |
| 01/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 44,590            |
| 02/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 47,775            |
| 03/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 50,960            |
| 04/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 54,145            |
| 05/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 57,330            |
| 06/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 60,515            |
| 07/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 63,700            |
| 08/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 66,885            |
| 09/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 70,070            |
| 10/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 73,255            |
| 11/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 76,440            |
| 12/82 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 79,625            |
| TOTAL | 12.0       | 1,968     | 15,876     | 20,016        | 336           | 1,992             |     |       | 38,220       |                   |
| 01/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 82,810            |
| 02/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 85,995            |
| 03/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 89,180            |
| 04/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 92,365            |
| 05/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 95,550            |
| 06/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 98,735            |
| 07/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 101,920           |
| 08/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 105,105           |
| 09/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 108,290           |
| 10/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 111,475           |
| 11/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 114,660           |
| 12/83 | 1.0        | 164       | 1,323      | 1,668         | 28            | 166               |     |       | 3,185        | 117,845           |
| TOTAL | 12.0       | 1,968     | 15,876     | 20,016        | 336           | 1,992             |     |       | 38,220       |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1B.06.03  
NAME: ETR MAINTENANCE & REFURBISHMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/80 | 4.0        | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 12,744            |
| 02/80 | 4.0        | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 25,488            |
| 03/80 | 4.0        | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 38,232            |
| 04/80 | 5.0        | 820       | 6,617      | 8,344         | 139           | 829               |     |       | 15,929       | 54,161            |
| 05/80 | 5.0        | 820       | 6,617      | 8,344         | 139           | 829               |     |       | 15,929       | 70,090            |
| 06/80 | 5.0        | 820       | 6,617      | 8,344         | 139           | 829               |     |       | 15,929       | 86,019            |
| 07/80 | 14.0       | 2,296     | 18,529     | 23,366        | 390           | 2,323             |     |       | 44,608       | 130,627           |
| 08/80 | 14.0       | 2,296     | 18,529     | 23,366        | 390           | 2,323             |     |       | 44,608       | 175,235           |
| 09/80 | 14.0       | 2,296     | 18,529     | 23,366        | 390           | 2,323             |     |       | 44,608       | 219,843           |
| 10/80 | 14.0       | 2,296     | 18,529     | 23,366        | 390           | 2,323             |     |       | 44,608       | 264,451           |
| 11/80 | 14.0       | 2,296     | 18,529     | 23,366        | 390           | 2,323             |     |       | 44,608       | 309,059           |
| 12/80 | 16.0       | 2,624     | 21,176     | 26,705        | 446           | 2,654             |     |       | 50,981       | 360,040           |
| TOTAL | 113.0      | 18,532    | 149,554    | 188,592       | 3,149         | 18,745            |     |       | 360,040      |                   |
| 01/81 | 16.0       | 2,624     | 21,176     | 26,705        | 446           | 2,654             |     |       | 50,981       | 411,021           |
| 02/81 | 16.0       | 2,624     | 21,176     | 26,705        | 446           | 2,654             |     |       | 50,981       | 462,002           |
| 03/81 | 16.0       | 2,624     | 21,176     | 26,705        | 446           | 2,654             |     |       | 50,981       | 512,983           |
| 04/81 | 16.0       | 2,624     | 21,176     | 26,705        | 446           | 2,654             |     |       | 50,981       | 563,964           |
| 05/81 | 16.0       | 2,624     | 21,176     | 26,705        | 446           | 2,654             |     |       | 50,981       | 614,945           |
| 06/81 | 16.0       | 2,624     | 21,176     | 26,705        | 446           | 2,654             |     |       | 50,981       | 665,926           |
| 07/81 | 25.0       | 4,100     | 33,087     | 41,726        | 697           | 4,148             |     |       | 79,658       | 745,584           |
| 08/81 | 25.0       | 4,100     | 33,087     | 41,726        | 697           | 4,148             |     |       | 79,658       | 825,242           |
| 09/81 | 25.0       | 4,100     | 33,087     | 41,726        | 697           | 4,148             |     |       | 79,658       | 904,900           |
| 10/81 | 27.0       | 4,428     | 35,734     | 45,063        | 753           | 4,480             |     |       | 86,030       | 990,930           |
| 11/81 | 27.0       | 4,428     | 35,734     | 45,063        | 753           | 4,480             |     |       | 86,030       | 1,076,960         |
| 12/81 | 27.0       | 4,428     | 35,734     | 45,063        | 753           | 4,480             |     |       | 86,030       | 1,162,990         |
| TOTAL | 252.0      | 41,328    | 333,519    | 420,597       | 7,026         | 41,808            |     |       | 802,950      |                   |
| 01/82 | 40.0       | 6,560     | 52,939     | 66,760        | 1,115         | 6,637             |     |       | 127,451      | 1,290,441         |
| 02/82 | 40.0       | 6,560     | 52,939     | 66,760        | 1,115         | 6,637             |     |       | 127,451      | 1,417,892         |
| 03/82 | 40.0       | 6,560     | 52,939     | 66,760        | 1,115         | 6,637             |     |       | 127,451      | 1,545,343         |
| 04/82 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 1,714,218         |
| 05/82 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 1,883,093         |
| 06/82 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 2,051,968         |
| 07/82 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 2,220,843         |
| 08/82 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 2,389,718         |
| 09/82 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 2,558,593         |
| 10/82 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 2,727,468         |
| 11/82 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 2,896,343         |
| 12/82 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 3,065,218         |
| TOTAL | 597.0      | 97,908    | 790,113    | 996,402       | 16,647        | 99,066            |     |       | 1,902,228    |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.18.06.03  
NAME: ETR MAINTENANCE & REFURBISHMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/83 | 55.0       | 9,020     | 72,791     | 91,795        | 6,454,533     | 9,126             |     |       | 6,628,245    | 9,693,463         |
| 02/83 | 67.0       | 10,988    | 88,673     | 111,824       | 1,868         | 11,117            |     |       | 213,482      | 9,906,945         |
| 03/83 | 67.0       | 10,988    | 88,673     | 111,824       | 1,868         | 11,117            |     |       | 213,482      | 10,120,427        |
| 04/83 | 67.0       | 10,988    | 88,673     | 111,824       | 1,868         | 11,117            |     |       | 213,482      | 10,333,909        |
| 05/83 | 67.0       | 10,988    | 88,673     | 111,824       | 1,868         | 11,117            |     |       | 213,482      | 10,547,391        |
| 06/83 | 67.0       | 10,988    | 88,673     | 111,824       | 1,868         | 11,117            |     |       | 213,482      | 10,760,873        |
| 07/83 | 67.0       | 10,988    | 88,673     | 111,824       | 1,868         | 11,117            |     |       | 213,482      | 10,974,355        |
| 08/83 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 11,143,230        |
| 09/83 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 11,312,105        |
| 10/83 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 11,480,980        |
| 11/83 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 11,649,855        |
| 12/83 | 53.0       | 8,692     | 70,144     | 88,458        | 1,478         | 8,795             |     |       | 168,875      | 11,818,730        |
| TOTAL | 722.0      | 118,408   | 955,549    | 1,205,029     | 6,473,131     | 119,803           |     |       | 8,753,512    |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1B.06.04  
NAME: ETR LAUNCH

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/83 |            |           |            |               | 78,000        |                   |     |       | 78,000       | 78,000            |
| 02/83 |            |           |            |               |               |                   |     |       |              | 78,000            |
| 03/83 |            |           |            |               |               |                   |     |       |              | 78,000            |
| 04/83 |            |           |            |               |               |                   |     |       |              | 78,000            |
| 05/83 |            |           |            |               |               |                   |     |       |              | 78,000            |
| 06/83 |            |           |            |               |               |                   |     |       |              | 78,000            |
| 07/83 |            |           |            |               |               |                   |     |       |              | 78,000            |
| 08/83 |            |           |            |               |               |                   |     |       |              | 78,000            |
| 09/83 |            |           |            |               |               |                   |     |       |              | 78,000            |
| 10/83 |            |           |            |               |               |                   |     |       |              | 78,000            |
| 11/83 |            |           |            |               |               |                   |     |       |              | 78,000            |
| 12/83 |            |           |            |               |               |                   |     |       |              | 78,000            |
| TOTAL |            |           |            |               | 78,000        |                   |     |       | 78,000       |                   |

NO: 2A.1B.07.02  
NAME: EASTERN TEST RANGE GSE

|       |     |     |       |       |    |     |  |  |       |       |
|-------|-----|-----|-------|-------|----|-----|--|--|-------|-------|
| 01/80 |     |     |       |       |    |     |  |  |       |       |
| 02/80 |     |     |       |       |    |     |  |  |       |       |
| 03/80 |     |     |       |       |    |     |  |  |       |       |
| 04/80 |     |     |       |       |    |     |  |  |       |       |
| 05/80 |     |     |       |       |    |     |  |  |       |       |
| 06/80 |     |     |       |       |    |     |  |  |       |       |
| 07/80 |     |     |       |       |    |     |  |  |       |       |
| 08/80 |     |     |       |       |    |     |  |  |       |       |
| 09/80 |     |     |       |       |    |     |  |  |       |       |
| 10/80 |     |     |       |       |    |     |  |  |       |       |
| 11/80 |     |     |       |       |    |     |  |  |       |       |
| 12/80 | 2.0 | 328 | 2,647 | 3,340 | 56 | 332 |  |  | 6,375 | 6,375 |
| TOTAL | 2.0 | 328 | 2,647 | 3,340 | 56 | 332 |  |  | 6,375 |       |



DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1B.07.02  
NAME: EASTERN TEST RANGE GSE

| MO/YR | MANA MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GPE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|-------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/81 | 2.0         | 328       | 2,647      | 3,340         | 56            | 332               |     |       | 6,375        | 12,750            |
| 02/81 | 2.0         | 328       | 2,647      | 3,340         | 56            | 332               |     |       | 6,375        | 19,125            |
| 03/81 | 2.0         | 328       | 2,647      | 3,340         | 56            | 332               |     |       | 6,375        | 25,500            |
| 04/81 | 2.0         | 328       | 2,647      | 3,340         | 56            | 332               |     |       | 6,375        | 31,875            |
| 05/81 | 2.0         | 328       | 2,647      | 3,340         | 56            | 332               |     |       | 6,375        | 38,250            |
| 06/81 | 2.0         | 328       | 2,647      | 3,340         | 56            | 332               |     |       | 6,375        | 44,625            |
| 07/81 | 2.0         | 328       | 2,647      | 3,340         | 56            | 332               |     |       | 6,375        | 51,000            |
| 08/81 | 2.0         | 328       | 2,647      | 3,340         | 56            | 332               |     |       | 6,375        | 57,375            |
| 09/81 | 2.0         | 328       | 2,647      | 3,340         | 56            | 332               |     |       | 6,375        | 63,750            |
| 10/81 | 2.0         | 328       | 2,647      | 3,340         | 56            | 332               |     |       | 6,375        | 70,125            |
| 11/81 | 2.0         | 328       | 2,647      | 3,340         | 56            | 332               |     |       | 6,375        | 76,500            |
| 12/81 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 89,244            |
| TOTAL | 26.0        | 4,264     | 34,411     | 43,415        | 728           | 4,315             |     |       | 82,869       |                   |
| 01/82 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 101,988           |
| 02/82 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 114,732           |
| 03/82 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 127,476           |
| 04/82 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 140,220           |
| 05/82 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 152,964           |
| 06/82 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 165,708           |
| 07/82 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 178,452           |
| 08/82 | 6.0         | 984       | 7,941      | 10,015        | 167           | 996               |     |       | 19,119       | 197,571           |
| 09/82 | 6.0         | 984       | 7,941      | 10,015        | 167           | 996               |     |       | 19,119       | 216,690           |
| 10/82 | 6.0         | 984       | 7,941      | 10,015        | 167           | 996               |     |       | 19,119       | 235,809           |
| 11/82 | 6.0         | 984       | 7,941      | 10,015        | 167           | 996               |     |       | 19,119       | 254,928           |
| 12/82 | 6.0         | 984       | 7,941      | 10,015        | 167           | 996               |     |       | 19,119       | 274,047           |
| TOTAL | 58.0        | 9,512     | 76,763     | 96,800        | 1,619         | 9,621             |     |       | 184,803      |                   |
| 01/83 | 4.0         | 656       | 5,294      | 6,675         | 5,144,612     | 663               |     |       | 5,157,244    | 5,431,291         |
| 02/83 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 5,444,035         |
| 03/83 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 5,456,779         |
| 04/83 | 4.0         | 656       | 5,294      | 6,675         | 5,144,612     | 663               |     |       | 5,157,244    | 10,614,023        |
| 05/83 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 10,626,767        |
| 06/83 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 10,639,511        |
| 07/83 | 4.0         | 656       | 5,294      | 6,675         | 112           | 663               |     |       | 12,744       | 10,652,255        |
| 08/83 | 7.0         | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 10,674,559        |
| 09/83 | 7.0         | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 10,696,863        |
| 10/83 | 7.0         | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 10,719,167        |
| 11/83 | 7.0         | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 10,741,471        |
| 12/83 | 7.0         | 1,148     | 9,264      | 11,683        | 195           | 1,162             |     |       | 22,304       | 10,763,775        |
| TOTAL | 63.0        | 10,332    | 83,378     | 105,140       | 10,290,759    | 10,451            |     |       | 10,489,728   |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1C.01.02  
NAME: PROJECT MANAGEMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/83 |            |           |            |               |               |                   |     |       |              |                   |
| 02/83 |            |           |            |               |               |                   |     |       |              |                   |
| 03/83 |            |           |            |               |               |                   |     |       |              |                   |
| 04/83 |            |           |            |               |               |                   |     |       |              |                   |
| 05/83 |            |           |            |               |               |                   |     |       |              |                   |
| 06/83 |            |           |            |               |               |                   |     |       |              |                   |
| 07/83 | 2.0        | 328       | 2,647      | 3,278         | 56            | 332               |     |       | 6,313        | 6,313             |
| 08/83 | 2.0        | 328       | 2,647      | 3,278         | 56            | 332               |     |       | 6,313        | 12,626            |
| 09/83 | 2.0        | 328       | 2,647      | 3,278         | 56            | 332               |     |       | 6,313        | 18,939            |
| 10/83 | 2.0        | 328       | 2,647      | 3,278         | 56            | 332               |     |       | 6,313        | 25,252            |
| 11/83 | 2.0        | 328       | 2,647      | 3,278         | 56            | 332               |     |       | 6,313        | 31,565            |
| 12/83 | 2.0        | 328       | 2,647      | 3,278         | 56            | 332               |     |       | 6,313        | 37,878            |
| TOTAL | 12.0       | 1,968     | 15,882     | 19,668        | 336           | 1,992             |     |       | 37,878       |                   |

NO: 2A.1C.01.03  
NAME: INFORMATION MANAGEMENT

|       |      |       |        |        |     |       |  |  |        |        |
|-------|------|-------|--------|--------|-----|-------|--|--|--------|--------|
| 01/83 |      |       |        |        |     |       |  |  |        |        |
| 02/83 |      |       |        |        |     |       |  |  |        |        |
| 03/83 |      |       |        |        |     |       |  |  |        |        |
| 04/83 |      |       |        |        |     |       |  |  |        |        |
| 05/83 |      |       |        |        |     |       |  |  |        |        |
| 06/83 |      |       |        |        |     |       |  |  |        |        |
| 07/83 | 2.0  | 328   | 2,647  | 3,278  | 56  | 332   |  |  | 6,313  | 6,313  |
| 08/83 | 2.0  | 328   | 2,647  | 3,278  | 56  | 332   |  |  | 6,313  | 12,626 |
| 09/83 | 2.0  | 328   | 2,647  | 3,278  | 56  | 332   |  |  | 6,313  | 18,939 |
| 10/83 | 2.0  | 328   | 2,647  | 3,278  | 56  | 332   |  |  | 6,313  | 25,252 |
| 11/83 | 2.0  | 328   | 2,647  | 3,278  | 56  | 332   |  |  | 6,313  | 31,565 |
| 12/83 | 2.0  | 328   | 2,647  | 3,278  | 56  | 332   |  |  | 6,313  | 37,878 |
| TOTAL | 12.0 | 1,968 | 15,882 | 19,668 | 336 | 1,992 |  |  | 37,878 |        |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1C.06.05  
NAME: WTR MAINTENANCE & REFURBISHMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE    | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|--------|-------|--------------|-------------------|
| 01/81 |            |           |            |               | 500,000       |                   |        |       | 500,000      | 500,000           |
| 02/81 |            |           |            |               |               |                   |        |       |              | 500,000           |
| 03/81 |            |           |            |               |               |                   |        |       |              | 500,000           |
| 04/81 |            |           |            |               |               |                   |        |       |              | 500,000           |
| 05/81 |            |           |            |               |               |                   |        |       |              | 500,000           |
| 06/81 |            |           |            |               |               |                   |        |       |              | 500,000           |
| 07/81 |            |           |            |               |               |                   |        |       |              | 500,000           |
| 08/81 |            |           |            |               |               |                   |        |       |              | 500,000           |
| 09/81 |            |           |            |               |               |                   |        |       |              | 500,000           |
| 10/81 |            |           |            |               |               |                   |        |       |              | 500,000           |
| 11/81 |            |           |            |               |               |                   |        |       |              | 500,000           |
| 12/81 |            |           |            |               |               |                   |        |       |              | 500,000           |
| TOTAL |            |           |            |               | 500,000       |                   |        |       | 500,000      |                   |
| 01/82 |            |           |            |               | 761,000       |                   |        |       | 761,000      | 1,261,000         |
| 02/82 |            |           |            |               |               |                   |        |       |              | 1,261,000         |
| 03/82 |            |           |            |               |               |                   |        |       |              | 1,261,000         |
| 04/82 |            |           |            |               |               |                   |        |       |              | 1,261,000         |
| 05/82 |            |           |            |               |               |                   |        |       |              | 1,261,000         |
| 06/82 |            |           |            |               |               |                   |        |       |              | 1,261,000         |
| 07/82 |            |           |            |               |               |                   |        |       |              | 1,261,000         |
| 08/82 |            |           |            |               |               |                   |        |       |              | 1,261,000         |
| 09/82 |            |           |            |               |               |                   |        |       |              | 1,261,000         |
| 10/82 |            |           |            |               |               |                   |        |       |              | 1,261,000         |
| 11/82 |            |           |            |               |               |                   |        |       |              | 1,261,000         |
| 12/82 |            |           |            |               |               |                   |        |       |              | 1,261,000         |
| TOTAL |            |           |            |               | 761,000       |                   |        |       | 761,000      |                   |
| 01/83 | 1.0        | 164       | 1,323      | 1,637         | 730,028       | 166               |        |       | 733,154      | 1,994,154         |
| 02/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |       | 3,154        | 1,997,308         |
| 03/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |       | 3,154        | 2,000,462         |
| 04/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |       | 3,154        | 2,003,616         |
| 05/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |       | 3,154        | 2,006,770         |
| 06/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |       | 3,154        | 2,009,924         |
| 07/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |       | 3,154        | 2,013,078         |
| 08/83 | 35.0       | 5,740     | 46,322     | 118,379       | 976           | 61,295            |        |       | 226,972      | 2,240,050         |
| 09/83 | 35.0       | 5,740     | 46,322     | 91,002        | 976           | 36,407            | 16,751 |       | 191,458      | 2,431,508         |
| 10/83 | 35.0       | 5,740     | 46,322     | 91,002        | 976           | 36,407            |        |       | 174,707      | 2,606,215         |
| 11/83 | 35.0       | 5,740     | 46,322     | 91,002        | 976           | 36,407            |        |       | 174,707      | 2,780,922         |
| 12/83 | 35.0       | 5,740     | 46,322     | 91,002        | 976           | 36,407            | 16,751 |       | 191,458      | 2,972,380         |
| TOTAL | 182.0      | 29,848    | 240,871    | 493,846       | 735,076       | 208,085           | 33,502 |       | 1,711,380    |                   |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1C.06.08  
NAME: FACILITY OPERATIONS SUPPORT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 01/83 |            |           |            |               |               |                   |     |       |              |                   |
| 02/83 |            |           |            |               |               |                   |     |       |              |                   |
| 03/83 |            |           |            |               |               |                   |     |       |              |                   |
| 04/83 |            |           |            |               |               |                   |     |       |              |                   |
| 05/83 |            |           |            |               |               |                   |     |       |              |                   |
| 06/83 |            |           |            |               |               |                   |     |       |              |                   |
| 07/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |     |       | 3,154        | 3,154             |
| 08/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |     |       | 3,154        | 6,308             |
| 09/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |     |       | 3,154        | 9,462             |
| 10/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |     |       | 3,154        | 12,616            |
| 11/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |     |       | 3,154        | 15,770            |
| 12/83 | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |     |       | 3,154        | 18,924            |
| TOTAL | 6.0        | 984       | 7,938      | 9,822         | 168           | 996               |     |       | 18,924       |                   |

NO: 2A.1C.07.03  
NAME: WESTERN TEST RANGE GSE

|       |  |  |  |  |           |  |  |           |           |
|-------|--|--|--|--|-----------|--|--|-----------|-----------|
| 01/82 |  |  |  |  | 1,619,000 |  |  | 1,619,000 | 1,619,000 |
| 02/82 |  |  |  |  |           |  |  |           | 1,619,000 |
| 03/82 |  |  |  |  |           |  |  |           | 1,619,000 |
| 04/82 |  |  |  |  |           |  |  |           | 1,619,000 |
| 05/82 |  |  |  |  |           |  |  |           | 1,619,000 |
| 06/82 |  |  |  |  |           |  |  |           | 1,619,000 |
| 07/82 |  |  |  |  | 24,000    |  |  | 24,000    | 1,643,000 |
| 08/82 |  |  |  |  | 24,000    |  |  | 24,000    | 1,667,000 |
| 09/82 |  |  |  |  | 24,000    |  |  | 24,000    | 1,691,000 |
| 10/82 |  |  |  |  | 24,000    |  |  | 24,000    | 1,715,000 |
| 11/82 |  |  |  |  | 24,000    |  |  | 24,000    | 1,739,000 |
| 12/82 |  |  |  |  | 24,000    |  |  | 24,000    | 1,763,000 |
| TOTAL |  |  |  |  | 1,763,000 |  |  | 1,763,000 |           |

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY MONTH (WBS LEVEL 5)

NO: 2A.1C.07.03  
NAME: WESTERN TEST RANGE GSE

| MO/YR       | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE    | M & A   | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------------|------------|-----------|------------|---------------|---------------|-------------------|--------|---------|--------------|-------------------|
| 01/83       |            |           |            |               | 24,000        |                   |        |         | 24,000       | 1,787,000         |
| 02/83       |            |           |            |               | 24,000        |                   |        |         | 24,000       | 1,811,000         |
| 03/83       |            |           |            |               | 24,000        |                   |        |         | 24,000       | 1,835,000         |
| 04/83       |            |           |            |               | 24,000        |                   |        |         | 24,000       | 1,859,000         |
| 05/83       |            |           |            |               | 24,000        |                   |        |         | 24,000       | 1,883,000         |
| 06/83       |            |           |            |               | 24,000        |                   |        |         | 24,000       | 1,907,000         |
| 07/83       | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |         | 3,154        | 1,910,154         |
| 08/83       | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |         | 3,154        | 1,913,308         |
| 09/83       | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |         | 3,154        | 1,916,462         |
| 10/83       | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |         | 3,154        | 1,919,616         |
| 11/83       | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |         | 3,154        | 1,922,770         |
| 12/83       | 1.0        | 164       | 1,323      | 1,637         | 28            | 166               |        |         | 3,154        | 1,925,924         |
| TOTAL       | 6.0        | 984       | 7,936      | 9,822         | 144,168       | 996               |        |         | 162,924      |                   |
| PROP. TOTAL | 4,120.8    | 675,792   | 6,033,054  | 7,348,545     | 20,786,435    | 2,120,764         | 33,502 | 219,476 | 36,541,776   |                   |

## DDT&E - Summary of Other Direct Charges By Type By Month

DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
SUMMARY OF OTHER DIRECT CHARGES BY TYPE BY MONTH

| MO/YF      | FRINGE<br>BENEFITS | OTHER DIR<br>CHARGES | WTR LAUNCH<br>TRAVEL | TDY-RELOC<br>& PER DIEN | 747<br>FERRY | CDC 6000 | LEM 370 | KEYPUNCH | MISC.<br>ODC | TOTAL<br>ODC |
|------------|--------------------|----------------------|----------------------|-------------------------|--------------|----------|---------|----------|--------------|--------------|
| 01/80      |                    | 331                  |                      | 2,072                   |              | 9,390    |         | 1,170    |              | 12,963       |
| 02/80      |                    | 331                  |                      | 2,072                   |              |          |         |          |              | 2,403        |
| 03/80      |                    | 331                  |                      | 2,072                   |              |          |         |          |              | 2,403        |
| 04/80      |                    | 364                  |                      | 2,205                   |              |          |         |          |              | 2,569        |
| 05/80      |                    | 364                  |                      | 2,205                   |              |          |         |          |              | 2,569        |
| 06/80      |                    | 364                  |                      | 2,205                   |              |          |         |          |              | 2,569        |
| 07/80      |                    | 695                  |                      | 3,534                   |              |          |         |          |              | 4,229        |
| 08/80      |                    | 695                  |                      | 3,534                   |              |          |         |          |              | 4,229        |
| 09/80      |                    | 695                  |                      | 3,534                   |              |          |         |          |              | 4,229        |
| 10/80      |                    | 695                  |                      | 3,534                   |              |          |         |          |              | 4,229        |
| 11/80      |                    | 695                  |                      | 3,534                   |              |          |         |          |              | 4,229        |
| 12/80      |                    | 660                  |                      | 4,198                   |              |          |         |          |              | 5,058        |
| YEAR TOTAL |                    | 6,420                |                      | 34,699                  |              | 9,390    |         | 1,170    |              | 51,679       |
| 01/81      |                    | 860                  |                      | 4,929                   |              | 9,390    |         | 1,170    |              | 16,349       |
| 02/81      |                    | 860                  |                      | 4,929                   |              |          |         |          |              | 5,789        |
| 03/81      |                    | 860                  |                      | 4,929                   |              |          |         |          |              | 5,789        |
| 04/81      |                    | 860                  |                      | 4,929                   |              |          |         |          |              | 5,789        |
| 05/81      |                    | 860                  |                      | 4,929                   |              |          |         |          |              | 5,789        |
| 06/81      |                    | 860                  |                      | 4,929                   |              |          |         |          |              | 5,789        |
| 07/81      |                    | 1,158                |                      | 6,125                   |              |          |         |          |              | 7,283        |
| 08/81      |                    | 1,158                |                      | 6,125                   |              |          |         |          |              | 7,283        |
| 09/81      |                    | 1,158                |                      | 6,125                   |              |          |         |          |              | 7,283        |
| 10/81      |                    | 1,224                |                      | 6,391                   |              |          |         |          |              | 7,615        |
| 11/81      |                    | 1,224                |                      | 6,391                   |              |          |         |          |              | 7,615        |
| 12/81      |                    | 1,290                |                      | 6,656                   |              |          |         |          |              | 7,946        |
| YEAR TOTAL |                    | 12,272               |                      | 67,387                  |              | 9,390    |         | 1,170    |              | 90,319       |
| 01/82      |                    | 1,786                |                      | 13,431                  |              | 9,390    |         | 1,170    |              | 25,777       |
| 02/82      |                    | 1,786                |                      | 13,431                  |              |          |         |          |              | 15,217       |
| 03/82      |                    | 1,786                |                      | 13,431                  |              |          |         |          |              | 15,217       |
| 04/82      |                    | 2,217                |                      | 15,158                  |              |          |         |          |              | 17,375       |
| 05/82      |                    | 2,217                |                      | 15,158                  |              |          |         |          |              | 17,375       |
| 06/82      |                    | 2,217                |                      | 15,158                  |              |          |         |          |              | 17,375       |
| 07/82      |                    | 2,217                |                      | 15,158                  |              |          |         |          |              | 17,375       |
| 08/82      |                    | 2,284                |                      | 15,424                  |              |          |         |          |              | 17,708       |
| 09/82      |                    | 2,284                |                      | 15,424                  |              |          |         |          |              | 17,708       |
| 10/82      |                    | 2,284                |                      | 15,424                  |              |          |         |          |              | 17,708       |
| 11/82      |                    | 2,284                |                      | 15,424                  |              |          |         |          |              | 17,708       |
| 12/82      |                    | 2,284                |                      | 15,424                  |              |          |         |          |              | 17,708       |
| YEAR TOTAL |                    | 25,646               |                      | 178,045                 |              | 9,390    |         | 1,170    |              | 214,251      |

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DDT&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
SUMMARY OF OTHER DIRECT CHARGES BY TYPE BY MONTH

| MO/YR      | FRINGE<br>BENEFITS | OTHER DIR<br>CHARGES | WTR LAUNCH<br>TRAVEL | TDY-RELOC<br>& PER DIEN | 747<br>FERRY | CDC 6000 | IBM 370   | KEYPUNCH | MISC.<br>ODC | TOTAL<br>ODC |
|------------|--------------------|----------------------|----------------------|-------------------------|--------------|----------|-----------|----------|--------------|--------------|
| 01/83      |                    | 2,283                |                      | 19,142                  |              | 9,390    | 318,000   | 1,170    |              | 349,985      |
| 02/83      |                    | 2,680                |                      | 20,736                  |              |          |           |          |              | 23,416       |
| 03/83      |                    | 2,680                |                      | 20,736                  |              |          |           |          |              | 23,416       |
| 04/83      |                    | 2,680                |                      | 20,736                  |              |          | 318,000   |          |              | 341,416      |
| 05/83      |                    | 2,680                |                      | 20,736                  |              |          |           |          |              | 23,416       |
| 06/83      |                    | 2,680                |                      | 20,736                  |              |          |           |          |              | 23,416       |
| 07/83      |                    | 2,878                |                      | 21,534                  |              |          | 318,000   |          |              | 342,412      |
| 08/83      |                    | 3,640                |                      | 80,078                  |              |          |           |          |              | 83,718       |
| 09/83      |                    | 3,640                |                      | 55,190                  |              |          |           |          |              | 58,830       |
| 10/83      |                    | 3,640                |                      | 55,190                  |              |          | 318,000   |          |              | 376,830      |
| 11/83      |                    | 3,640                |                      | 55,190                  |              |          |           |          |              | 58,830       |
| 12/83      |                    | 3,640                |                      | 55,190                  |              |          |           |          |              | 58,830       |
| YEAR TOTAL |                    | 36,761               |                      | 445,194                 |              | 9,390    | 1,272,000 | 1,170    |              | 1,764,515    |
| PROP TOTAL |                    | 81,199               |                      | 725,325                 |              | 37,560   | 1,272,000 | 4,680    |              | 2,120,764    |



## DDT&E - Total Manpower Summary By Project Function Site

DC1&E - TUG LAUNCH SITE ACTIVATION  
732-R00  
TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION SITE

TUG FLEET UTILIZATION PROJECT MANAGEMENT

| YEAR | JAN  | FEB  | MAR  | APR  | MAY  | JUNE | JULY | AUG  | SEPT | OCT  | NOV  | DEC  | TOTAL |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980 | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 67.2  |
| 1981 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 133.2 |
| 1982 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 565.2 |
| 1983 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 901.2 |

1,666.8

WTR

|      |     |     |     |     |     |     |     |      |      |      |      |      |       |
|------|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|-------|
| 1983 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 7.0 | 41.0 | 41.0 | 41.0 | 41.0 | 41.0 | 218.0 |
|------|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|-------|

218.0

ETR

|      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980 | 10.0 | 10.0 | 10.0 | 11.0 | 11.0 | 11.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 26.0 | 194.0 |
| 1981 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 35.0 | 35.0 | 35.0 | 37.0 | 37.0 | 39.0 | 374.0 |
| 1982 | 54.0 | 54.0 | 54.0 | 67.0 | 67.0 | 67.0 | 67.0 | 69.0 | 69.0 | 69.0 | 69.0 | 69.0 | 775.0 |
| 1983 | 68.0 | 80.0 | 80.0 | 80.0 | 80.0 | 80.0 | 80.0 | 69.0 | 69.0 | 69.0 | 69.0 | 69.0 | 893.0 |

2,236.0

SUMMARY TOTAL:

|      |       |       |       |       |       |       |       |       |       |       |       |       |         |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| 1980 | 15.6  | 15.6  | 15.6  | 16.6  | 16.6  | 16.6  | 26.6  | 26.6  | 26.6  | 26.6  | 26.6  | 31.6  | 261.2   |
| 1981 | 37.1  | 37.1  | 37.1  | 37.1  | 37.1  | 37.1  | 46.1  | 46.1  | 46.1  | 48.1  | 48.1  | 50.1  | 507.2   |
| 1982 | 101.1 | 101.1 | 101.1 | 114.1 | 114.1 | 114.1 | 114.1 | 116.1 | 116.1 | 116.1 | 116.1 | 116.1 | 1,340.2 |
| 1983 | 144.1 | 156.1 | 156.1 | 156.1 | 156.1 | 156.1 | 162.1 | 185.1 | 185.1 | 185.1 | 185.1 | 185.1 | 2,012.2 |

4,120.8

## DDT&E - Total Manpower Summary By Project Function Elements (WBS Level 5)

DETLE - TUG LAUNCH SITE ACTIVATION

732-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION ELEMENTS (WBS LEVEL 5)

NO: TUG FLEET UTILIZATION PROJECT MANAGEMENT  
2A.1A.01.01  
NAME: COST/PERFORMANCE MANAGEMENT

|      |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1980 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 18.0 |
| 1981 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 18.0 |
| 1982 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1983 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 72.0 |

156.0

NO: 2A.1A.01.02  
NAME: PROJECT DIRECTION

|      |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1980 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |
| 1981 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |
| 1982 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |
| 1983 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |

144.0

NO: 2A.1A.01.03  
NAME: INFORMATION MANAGEMENT

|      |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1980 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1981 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 30.0 |
| 1982 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1983 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |

138.0

LDTEE - TUG LAUNCH SITE ACTIVATION  
732-R00  
TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION ELEMENTS (WBS LEVEL 5)

TUG FLEET UTILIZATION PROJECT MANAGEMENT  
NO: 2A.1A.01.04  
NAME: FLEET UTILIZATION

| YEAR | JAN  | FEB  | MAR  | APR  | MAY  | JUNE | JULY | AUG  | SEPT | OCT  | NOV  | DEC  | TOTAL |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1981 | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 24.0  |
| 1982 | 6.0  | 6.0  | 6.0  | 6.0  | 6.0  | 6.0  | 6.0  | 6.0  | 6.0  | 6.0  | 6.0  | 6.0  | 72.0  |
| 1983 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | 132.0 |
|      |      |      |      |      |      |      |      |      |      |      |      |      | 228.0 |

NO: 2A.1A.02.01  
NAME: TUG SYSTEMS ENGINEERING

|      |     |     |     |     |     |     |     |     |     |     |     |     |       |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1982 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 24.0  |
| 1983 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 108.0 |
|      |     |     |     |     |     |     |     |     |     |     |     |     | 132.0 |

NO: 2A.1A.02.04  
NAME: SUSTAINING ENGINEERING

|      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1981 | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 24.0  |
| 1982 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 20.0 | 240.0 |
| 1983 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 24.0 | 288.0 |
|      |      |      |      |      |      |      |      |      |      |      |      |      | 552.0 |

NO: 2A.1A.05.02  
NAME: TRAINING

|      |     |     |     |     |     |     |     |     |     |     |     |     |       |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1982 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 96.0  |
| 1983 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 96.0  |
|      |     |     |     |     |     |     |     |     |     |     |     |     | 192.0 |

NO: 2A.1A.05.03  
NAME: INVENTORY CONTROL & WAREHOUSING

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1983 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 72.0 |
|      |     |     |     |     |     |     |     |     |     |     |     |     | 72.0 |

## DDT&amp;E - TUG LAUNCH SITE ACTIVATION

732-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION ELEMENTS (WBS LEVEL 5)

NO: TUG FLEET UTILIZATION PROJECT MANAGEMENT  
 NAME: 2A.1A.05.04  
 DEPOT MAINTENANCE

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1983 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0  | 1.0  | 1.0 | 1.0  | 1.0 | 1.0 | 1.0 | 12.0  |
|      |     |     |     |     |     |      |      |     |      |     |     |     | 12.0  |

NO: 2A.1A.15.03  
 NAME: GSE SOFTWARE

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1980 | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | 1.2  |
| 1981 | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | 1.2  |
| 1982 | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | .1  | 1.2  |
| 1983 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 37.2 |
|      |     |     |     |     |     |     |     |     |     |     |     |     | 40.8 |

## DEPARTMENT TOTAL:

|      |      |      |      |      |      |      |      |      |      |      |      |      |         |
|------|------|------|------|------|------|------|------|------|------|------|------|------|---------|
| 1980 | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 5.6  | 67.2    |
| 1981 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 133.2   |
| 1982 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 565.2   |
| 1983 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 75.1 | 901.2   |
|      |      |      |      |      |      |      |      |      |      |      |      |      | 1,666.8 |

BDTEF - TUG LAUNCH SITE ACTIVATION  
732-R00  
TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION ELEMENTS (WBS LEVEL 5)

NO: 2A.1B.01.02  
NAME: PROJECT MANAGEMENT

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1980 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0  | 7.0  | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 78.0  |
| 1981 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 7.0  | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 84.0  |
| 1982 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0  | 9.0  | 9.0 | 9.0  | 9.0 | 9.0 | 9.0 | 108.0 |
| 1983 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0  | 8.0  | 8.0 | 8.0  | 8.0 | 8.0 | 8.0 | 96.0  |

366.0

NO: 2A.1B.01.03  
NAME: INFORMATION MANAGEMENT

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1980 |     |     |     |     |     |     |     |     |     |     |     | 1.0 | 1.0  |
| 1981 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1982 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1983 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |

37.0

NO: 2A.1B.06.03  
NAME: ETF MAINTENANCE & REFURBISHMENT

|      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980 | 4.0  | 4.0  | 4.0  | 5.0  | 5.0  | 5.0  | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 16.0 | 113.0 |
| 1981 | 16.0 | 16.0 | 16.0 | 16.0 | 16.0 | 16.0 | 25.0 | 25.0 | 25.0 | 27.0 | 27.0 | 27.0 | 252.0 |
| 1982 | 40.0 | 40.0 | 40.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 597.0 |
| 1983 | 55.0 | 67.0 | 67.0 | 67.0 | 67.0 | 67.0 | 67.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 722.0 |

1,684.0

NO: 2A.1B.07.02  
NAME: EASTERN TEST RANGE CSE

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1980 |     |     |     |     |     |     |     |     |     |     |     | 2.0 | 2.0  |
| 1981 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 26.0 |
| 1982 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 58.0 |
| 1983 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 63.0 |

149.0

DEPARTMENT TOTAL:

| YEAR | JAN  | FEB  | MAR  | APR  | MAY  | JUNE | JULY | AUG  | SEPT | OCT  | NOV  | DEC  | TOTAL |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980 | 10.0 | 10.0 | 10.0 | 11.0 | 11.0 | 11.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 26.0 | 194.0 |
| 1981 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 35.0 | 35.0 | 35.0 | 37.0 | 37.0 | 39.0 | 374.0 |
| 1982 | 54.0 | 54.0 | 54.0 | 67.0 | 67.0 | 67.0 | 67.0 | 69.0 | 69.0 | 69.0 | 69.0 | 69.0 | 775.0 |
| 1983 | 68.0 | 80.0 | 80.0 | 80.0 | 80.0 | 80.0 | 80.0 | 69.0 | 69.0 | 69.0 | 69.0 | 69.0 | 693.0 |

2,236.0

## DDT&amp;E - TUG LAUNCH SITE ACTIVATION

732-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION ELEMENTS (WBS LEVEL 5)

NO: WTR  
2A.1C.01.02  
NAME: PROJECT MANAGEMENT

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1983 |     |     |     |     |     |      | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 12.0  |

2A.1C.01.03  
INFORMATION MANAGEMENT

|      |  |  |  |  |  |  |     |     |     |     |     |     |      |
|------|--|--|--|--|--|--|-----|-----|-----|-----|-----|-----|------|
| 1983 |  |  |  |  |  |  | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 12.0 |
|      |  |  |  |  |  |  |     |     |     |     |     |     | 12.0 |

NO: 2A.1C.06.05  
NAME: WTR MAINTENANCE & REFURBISHMENT

|      |     |     |     |     |     |     |     |      |      |      |      |      |       |
|------|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|-------|
| 1983 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 182.0 |
|      |     |     |     |     |     |     |     |      |      |      |      |      | 182.0 |

NO: 2A.1C.06.08  
NAME: FACILITY OPERATIONS SUPPORT

|      |  |  |  |  |  |  |     |     |     |     |     |     |     |
|------|--|--|--|--|--|--|-----|-----|-----|-----|-----|-----|-----|
| 1983 |  |  |  |  |  |  | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 6.0 |
|      |  |  |  |  |  |  |     |     |     |     |     |     | 6.0 |

NO: 2A.1C.07.03  
NAME: WESTERN TEST RANGE GSE

|      |  |  |  |  |  |  |     |     |     |     |     |     |     |
|------|--|--|--|--|--|--|-----|-----|-----|-----|-----|-----|-----|
| 1983 |  |  |  |  |  |  | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 6.0 |
|      |  |  |  |  |  |  |     |     |     |     |     |     | 6.0 |

DEPARTMENT TOTAL:

|      |     |     |     |     |     |     |     |      |      |      |      |      |       |
|------|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|-------|
| 1983 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 7.0 | 41.0 | 41.0 | 41.0 | 41.0 | 41.0 | 218.0 |
|      |     |     |     |     |     |     |     |      |      |      |      |      | 218.0 |



### III. OPERATIONS - TUG LAUNCH SITE SUPPORT - TIMELINE FUNDING

### III. OPERATIONS - TUG LAUNCH SITE SUPPORT TIMELINE FUNDING

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Operations phase funding from January 1984 through December 1991 is shown in the following tabulated data. These costs are based on fiscal year 1974 dollars throughout.

Fleet Utilization Project Management costs represent the cost of project level cost/performance management depot maintenance, long range scheduling of the Tug fleet, and sustaining engineering.

Ground and Launch Operations at WTR indicate the cost of the launch/recovery support crews, propellants, spares, and facility maintenance.

Ground and Launch Operations at ETR indicate the cost of the operational crews supporting refurbishment at the central processing facilities and checkout crews, facility maintenance costs, propellants, spares and central warehousing.

The overall Tug ETR launch site crew size and makeup was determined through an analysis of the stick and ball chart contained in subplan A. The organization shown in Figure 18 would be typical for the refurbishment/checkout of a single Tug at ETR on a two-shift-per-day basis. Analysis of the traffic model has shown that this "single cycle" operations crew is large enough to fulfill the ETR requirements. WTR operations impose additional requirements and the total ETR/WTR operations crew requirement is shown in Figure 19. This figure represents a crew of 107 people stationed permanently at ETR with seven additional people stationed at WTR. An operations crew, from ETR personnel, would follow the Tug to WTR and return to ETR following launch. In addition to the operations crew, fleet management requires a typical organization of 85 people (Figure 20) during the operational phase of the Tug program. Functional details of the management organization are found in Subplan B.

Tug timeline funding for the Tug program ground operations phase reflect the cost of processing the Tug in a factory clean environment in the VAB. The funding diagrams represent an estimated program cost each year based on 1974 dollar labor rates currently used by the Martin Marietta Corporation and a constant direct labor overhead rate of 110%, which was a NASA-directed rate applied to this study. Due to different accounting practices, management and administrative rates, overhead and computer unit costs are estimated as if the work were performed at Martin Marietta's Denver Data Center for all computer costs shown in the software WBS item. All major material procurement such as spares, propellants, and gases were treated as GFE with no rates applied. Refer to the Basis for Estimate (Section IVD) for details.

Table 1 displays the estimated activation cost differences between the various processing options considered in this study. The cost of Option 6 was spread through the DDT&E phase, from 1980 through 1983, along with the projected manpower buildup as shown by Tables 4 and 5.

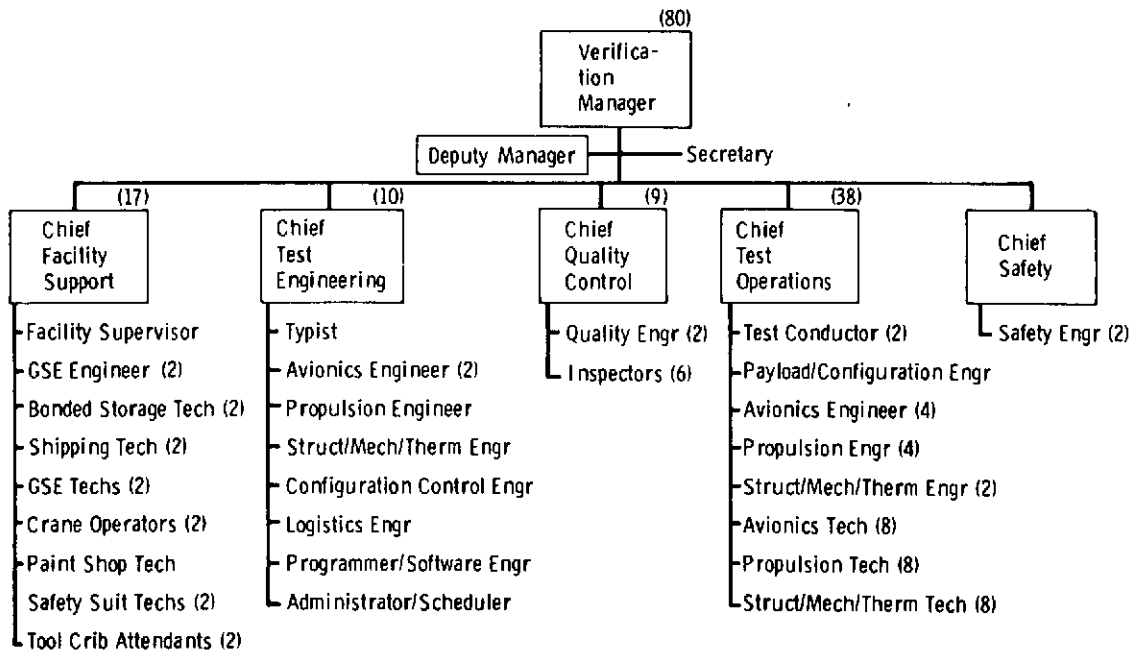
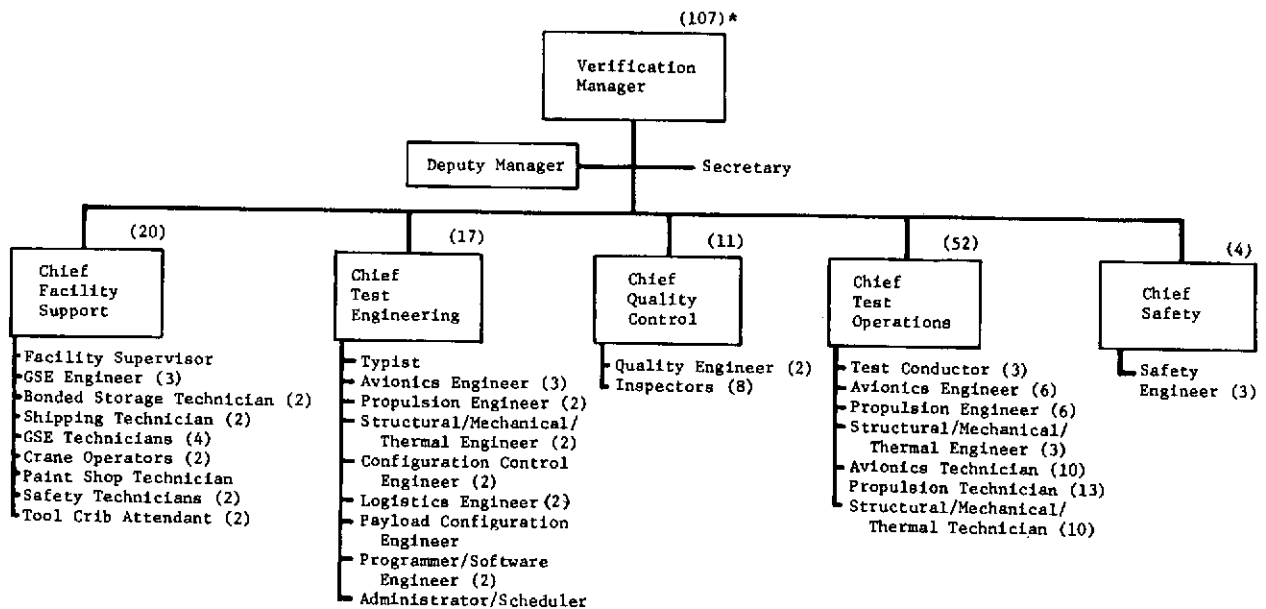


Figure 18 ETR Launch Site Operations Crew Size



\*Includes WTR Support Personnel

Figure 19 ETR Crew Organization (With WTR Launch Capability)

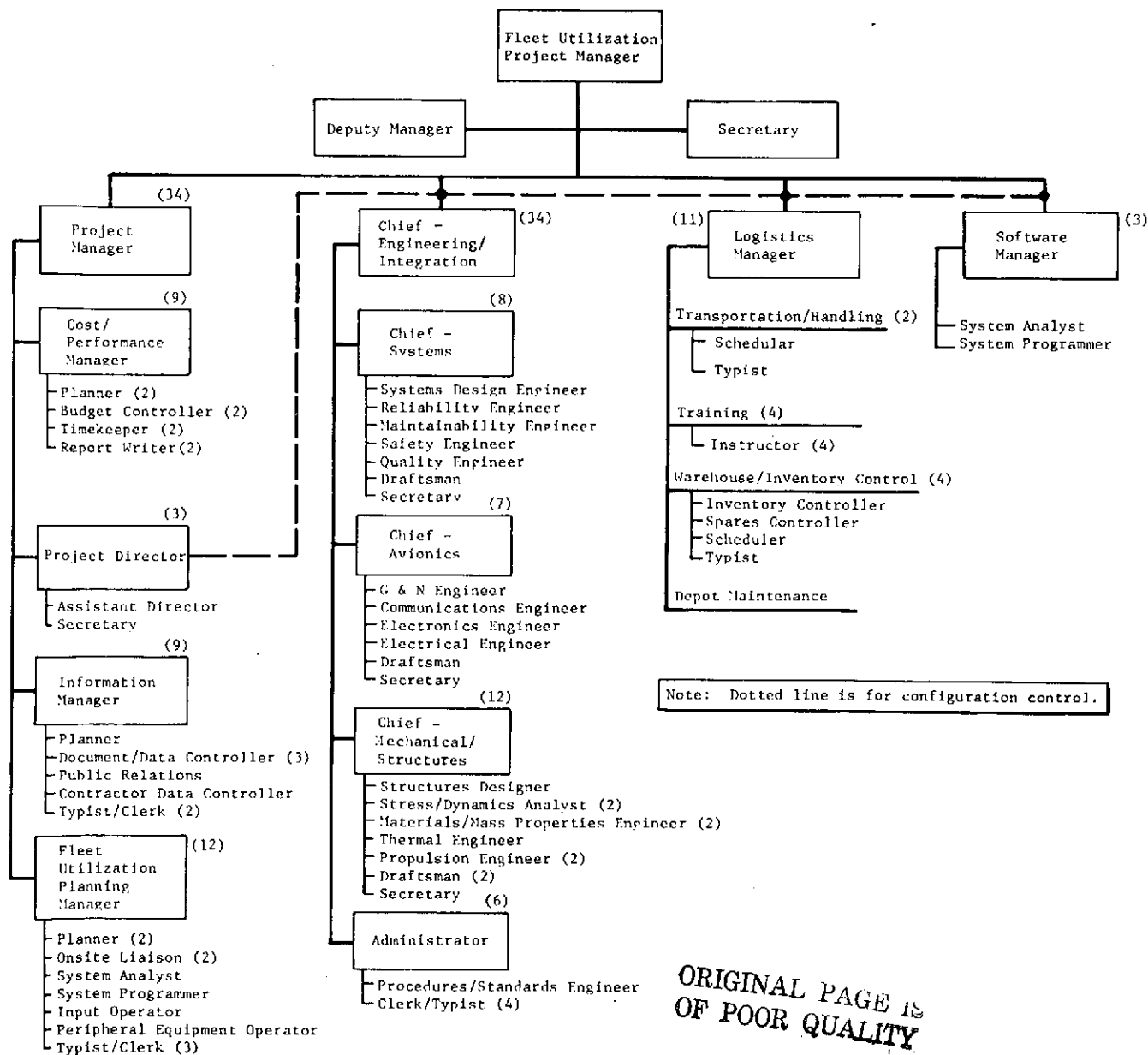


Figure 20 Fleet Utilization Management Organization

Table 7 Operations Phase Timeline Funding

| Project Function                     | Calendar Year |       |       |       |       |       |       |       |        |
|--------------------------------------|---------------|-------|-------|-------|-------|-------|-------|-------|--------|
|                                      | 1984          | 1985  | 1986  | 1987  | 1988  | 1989  | 1990  | 1991  | Total  |
| Fleet Utilization Project Management | 7.22          | 7.46  | 7.64  | 6.97  | 6.97  | 6.75  | 7.86  | 7.39  | 58.26  |
| Ground and Launch Operations, ETR    | 5.78          | 6.21  | 6.21  | 5.87  | 5.87  | 5.70  | 6.38  | 6.21  | 48.24  |
| Ground and Launch Operations, WTR    | 0.84          | 0.60  | 0.84  | 0.60  | 0.60  | 0.60  | 0.84  | 0.60  | 5.52   |
| Ground Operations Total              | 13.85         | 14.27 | 14.70 | 13.44 | 13.44 | 13.06 | 15.08 | 14.21 | 112.05 |

The total ground operations task yearly funding is shown in Figure 21. The cost fluctuations could be smoothed during the DDT&E phase by rescheduling the construction costs. The minor perturbations in the operational phase are due to variations in annual launch rates.

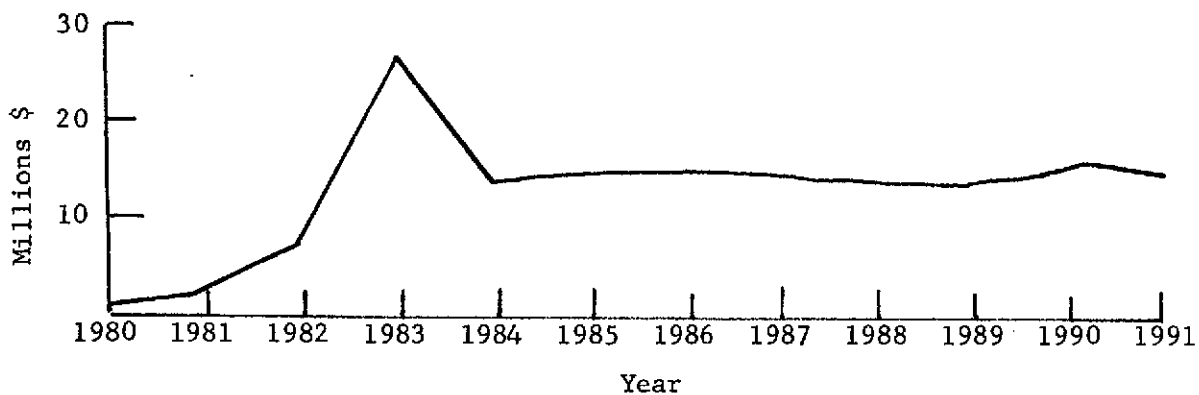


Figure 21 Tug Ground Operations Yearly Funding

These data summarize the detailed estimate of all the personnel, material, facilities, GSE, maintenance and travel costs. Evaluation of site modification costs and maintenance at ETR and WTR was performed by personnel familiar with the requirements of these particular sites. Evaluation of the personnel requirements at each of the three project functions were made by engineering personnel familiar with the task requirements peculiar to the site function. Materials were priced using current known costs, spares costs were forecast from results of an earlier study. All items were compiled using a computerized cost proposal model with appropriate overhead rates and factors applied. Refer to the following compiled data for more detailed information.

The costs relating to the operations phase, defined as the launch of the first vehicle, are total program costs from January 1984 through December 1991. Those costs are shown on Figure 22. The listed WBS element contains the total cost of each of the WBS elements.

|                                    |         | <u>Project Function</u>     |
|------------------------------------|---------|-----------------------------|
| Tug Fleet Utilization Project      |         | \$58.26                     |
| Project Management                 | \$11.54 |                             |
| System Engineering and Integration | 11.89   |                             |
| Logistics                          | 21.78   |                             |
| Software                           | 13.05   |                             |
| Ground and Launch Operations, ETR  |         | 48.24                       |
| Site Management                    | 1.83    |                             |
| Facilities                         | 9.13    |                             |
| GSE                                | 2.14    |                             |
| Launch Operations                  | 12.95   |                             |
| Refurbishment and Integration      | 22.19   |                             |
| Ground and Launch Operations, WTR  |         | 5.55                        |
| Site Management                    | .91     |                             |
| Facilities                         | 1.25    |                             |
| GSE                                | .46     |                             |
| Launch Operations                  | 1.88    |                             |
| Refurbishment and Integration      | 1.05    |                             |
|                                    |         | <u>Total \$112.05</u>       |
|                                    |         | Average Cost Flight \$ 0.68 |

*Figure 22 Operations Phase Costs 1984-1991*

The average cost/flight is derived from the total operations phase costs and the total number of flights. Comparisons on other basis such as cost/flight/year will vary the average because the launch rate is not constant whereas the manpower is constant.

Although the total flights decreased from about 254 last year to 165 this year the cost per flight for ground operations increased only slightly. This is because of some significant cost savings that are realized as a result of improved concepts. For example:

- 1) Factory clean environment processing costs less than the 100K clean processing because of elimination of special airlocks on buildings and continuous maintenance costs of the facility filtering system and additional maintenance personnel. Additional maintenance costs alone could run \$100,000 per year.
- 2) Crew sharing between ETR and WTR to support launches instead of a full-time crew reduced costs at WTR by almost \$5M over the eight years of operations.
- 3) Central Tug Processing Facility at ETR reduces the duplication of facilities and GSE requirements. Total duplication of the facility would add nearly \$16M to the DDT&E phase costs at WTR.
- 4) The fleet management approach results in cost savings by providing continuous monitoring of Tug usage requirement and projected usage, thus providing advanced planning on spares procurement, major modifications to the Tug, and advanced assignment of Tugs to spacecraft with the capability of real-time assignment changes due to vehicle capability analyses.

## Operation - Total Cost Summary By WBS Element



OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
TOTAL COST SUMMARY BY WBS ELEMENT

| WBS ELEMENT | DESCRIPTION                        | TOTAL          |
|-------------|------------------------------------|----------------|
| 2C          | OPERATIONS (GROUND)                | \$ 112,054,292 |
| 2C.1A       | TUG FLEET UTILIZATION/PROJECT MGMT | 58,264,035     |
| 2C.1A.01    | PROJECT MANAGEMENT                 | 11,538,528     |
| 2C.1A.01.01 | COST/PERFORMANCE MANAGEMENT        | 3,146,880      |
| 2C.1A.01.02 | PROJECT DIRECTION                  | 1,048,896      |
| 2C.1A.01.03 | INFORMATION MANAGEMENT             | 3,146,880      |
| 2C.1A.01.04 | FLEET UTILIZATION                  | 4,195,872      |
| 2C.1A.02    | SYSTEMS ENGINEERING & INTEGRATION  | 11,888,352     |
| 2C.1A.02.04 | SUSTAINING ENGINEERING             | 11,888,352     |
| 2C.1A.05    | LOGISTICS                          | 21,780,203     |
| 2C.1A.05.01 | TRANSPORTATION & HANDLING          | 1,139,264      |
| 2C.1A.05.02 | TRAINING                           | 1,398,720      |
| 2C.1A.05.03 | INVENTORY CONTROL & WAREHOUSING    | 1,529,832      |
| 2C.1A.05.04 | DEPOT MAINTENANCE                  | 17,712,387     |
| 2C.1A.15    | SOFTWARE                           | 13,056,952     |
| 2C.1A.15.03 | GSE SOFTWARE                       | 13,056,952     |
| 2C.1B       | GROUND & LAUNCH OPERATIONS - ETR   | 48,240,673     |
| 2C.1B.01    | SITE MANAGEMENT (ETR)              | 1,835,424      |
| 2C.1B.01.02 | PROJECT MANAGEMENT                 | 1,223,424      |
| 2C.1B.01.03 | INFORMATION MANAGEMENT             | 612,000        |
| 2C.1B.06    | FACILITIES - ETR                   | 9,128,832      |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-000  
TOTAL COST SUMMARY BY WBS ELEMENT

08

| WBS ELEMENT | DESCRIPTION                         | TOTAL      |
|-------------|-------------------------------------|------------|
| 2C.1B.06.03 | ETR MAINTENANCE & REFURBISHMENT     | 5,152,416  |
| 2C.1B.06.07 | FACILITY OPERATIONS SUPPORT         | 3,976,416  |
| 2C.1B.07    | GROUND SUPPORT EQUIPMENT - ETR      | 2,141,184  |
| 2C.1B.07.02 | EASTERN TEST RANGE - GSE            | 2,141,184  |
| 2C.1B.10    | LAUNCH OPERATIONS - ETR             | 12,950,108 |
| 2C.1B.10.01 | LAUNCH SITE SERVICES/SUPPORT        | 1,223,424  |
| 2C.1B.10.02 | TUG SHUTTLE MATING & CHECKOUT       | 4,397,472  |
| 2C.1B.10.03 | PRELAUNCH CHECKOUT & COUNTDOWN      | 1,450,813  |
| 2C.1B.10.04 | PROPELLANTS & GASES                 | 2,579,654  |
| 2C.1B.10.05 | POSTFLIGHT SAFING                   | 3,298,745  |
| 2C.1B.14    | REFURBISHMENT & INTEGRATION - ETR   | 22,185,125 |
| 2C.1B.14.01 | SCHEDULED MAINTENANCE & REFURBISH   | 15,327,750 |
| 2C.1B.14.02 | UNSCHEDULED MAINTENANCE & REFURBISH | 1,070,784  |
| 2C.1B.14.03 | POST MAINTENANCE CHECKOUT           | 3,170,109  |
| 2C.1B.14.04 | TUG/SPACECRAFT MATING & CHECKOUT    | 2,124,072  |
| 2C.1B.14.05 | REFURBISHMENT REQUIREMENTS PLANNING | 492,410    |
| 2C.1C       | GROUND & LAUNCH OPERATIONS - WTR    | 5,549,584  |
| 2C.1C.01    | SITE MANAGEMENT (WTR)               | 908,832    |
| 2C.1C.01.02 | PROJECT MANAGEMENT                  | 606,048    |
| 2C.1C.01.03 | INFORMATION MANAGEMENT              | 302,784    |
| 2C.1C.06    | FACILITIES - WTR                    | 1,245,568  |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
TOTAL COST SUMMARY BY WBS ELEMENT

| WBS ELEMENT    | DESCRIPTION                         | TOTAL          |
|----------------|-------------------------------------|----------------|
| 2C.1C.06.05    | WTR MAINTENANCE & REFURBISHMENT     | \$ 942,784     |
| 2C.1C.06.08    | FACILITY OPERATIONS SUPPORT         | 302,784        |
| 2C.1C.07       | GROUND SUPPORT EQUIPMENT -WTR       | 462,784        |
| 2C.1C.07.03    | WESTERN TEST RANGE - GSE            | 462,784        |
| 2C.1C.09       | LAUNCH OPERATIONS - WTR             | 1,879,909      |
| 2C.1C.09.01    | LAUNCH SITE SERVICES/SUPPORT        | 302,784        |
| 2C.1C.09.02    | TUG SHUTTLE MATING & CHECKOUT       | 1,007,666      |
| 2C.1C.09.03    | PRELAUNCH CHECKOUT & COUNTDOWN      | 138,831        |
| 2C.1C.09.04    | PROPELLANTS & GASES                 | 184,261        |
| 2C.1C.09.05    | POSTFLIGHT SAFING                   | 246,367        |
| 2C.1C.13       | REFURBISHMENT & INTEGRATION - WTR   | 1,052,491      |
| 2C.1C.13.01    | SCHEDULED MAINTENANCE & REFURBISH   | 754,039        |
| 2C.1C.13.03    | POST MAINTENANCE CHECKOUT           | 131,901        |
| 2C.1C.13.04    | TUG/SPACECRAFT MATING & CHECKOUT    | 138,831        |
| 2C.1C.13.05    | REFURBISHMENT REQUIREMENTS PLANNING | 27,720         |
| PROPOSAL TOTAL |                                     | \$ 112,054,292 |

Operation - Operations Total Cost By Year

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
OPERATIONS TOTAL COST BY YEAR

| MO/YR | MAN<br>MONTHS | MAN<br>HOURS | LABOR<br>COST | OVERHEAD<br>COST | MATL/S/C<br>COST | OTHER DIR<br>CHARGES | GFE       | M & A     | TOTAL<br>AMOUNT | CUMULATIVE<br>AMOUNT |
|-------|---------------|--------------|---------------|------------------|------------------|----------------------|-----------|-----------|-----------------|----------------------|
| 1984  | 2,449.2       | 401,664      | 3,588,070     | 4,401,346        | 3,527,358        | 1,801,580            | 318,269   | 214,187   | 13,850,810      | 13,850,810           |
| 1985  | 2,437.2       | 399,696      | 3,568,019     | 4,344,033        | 4,051,073        | 1,727,182            | 368,522   | 214,187   | 14,273,016      | 28,123,826           |
| 1986  | 2,419.2       | 396,744      | 3,537,946     | 4,346,218        | 4,400,318        | 1,797,584            | 402,024   | 214,187   | 14,698,277      | 42,822,103           |
| 1987  | 2,419.2       | 396,744      | 3,537,947     | 4,310,961        | 3,352,785        | 1,724,782            | 301,518   | 214,187   | 13,442,180      | 56,264,283           |
| 1988  | 2,419.2       | 396,744      | 3,537,947     | 4,310,961        | 3,352,785        | 1,724,782            | 301,518   | 214,187   | 13,442,180      | 69,706,463           |
| 1989  | 2,419.2       | 396,744      | 3,537,947     | 4,310,961        | 3,003,641        | 1,724,782            | 268,016   | 214,187   | 13,059,534      | 82,765,997           |
| 1990  | 2,419.2       | 396,744      | 3,537,946     | 4,346,218        | 4,749,362        | 1,797,584            | 435,526   | 214,187   | 15,080,823      | 97,846,820           |
| 1991  | 2,419.2       | 396,744      | 3,537,947     | 4,310,961        | 4,051,073        | 1,724,782            | 368,522   | 214,187   | 14,207,472      | 112,054,292          |
| PROP. |               |              |               |                  |                  |                      |           |           |                 |                      |
| TOTAL | 19,401.6      | 3,181,824    | 28,383,769    | 34,681,659       | 30,488,395       | 14,023,058           | 2,763,915 | 1,713,496 | 112,054,292     |                      |

Operation - Cost By Project Function By Year (WBS Level PF)

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY PROJECT FUNCTION BY YEAR (WBS LEVEL PF)

NO: 2C.1A  
NAME: TUG FLEET UTILIZATION/PROJECT MGMT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A   | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|---------|--------------|-------------------|
| 1984  | 997.2      | 163,536   | 1,666,404  | 1,833,036     | 2,014,437     | 1,495,052         |     | 214,187 | 7,223,116    | 7,223,116         |
| 1985  | 985.2      | 161,568   | 1,646,352  | 1,810,980     | 2,332,506     | 1,453,456         |     | 214,187 | 7,457,481    | 14,680,597        |
| 1986  | 967.2      | 158,616   | 1,616,280  | 1,777,908     | 2,544,552     | 1,491,056         |     | 214,187 | 7,643,983    | 22,324,580        |
| 1987  | 967.2      | 158,616   | 1,616,280  | 1,777,908     | 1,908,414     | 1,451,056         |     | 214,187 | 6,967,845    | 29,292,425        |
| 1988  | 967.2      | 158,616   | 1,616,280  | 1,777,908     | 1,908,414     | 1,451,056         |     | 214,187 | 6,967,845    | 36,260,270        |
| 1989  | 967.2      | 158,616   | 1,616,280  | 1,777,908     | 1,696,368     | 1,451,056         |     | 214,187 | 6,755,799    | 43,016,069        |
| 1990  | 967.2      | 158,616   | 1,616,280  | 1,777,908     | 2,756,598     | 1,491,056         |     | 214,187 | 7,856,029    | 50,872,098        |
| 1991  | 967.2      | 158,616   | 1,616,280  | 1,777,908     | 2,332,506     | 1,451,056         |     | 214,187 | 7,391,937    | 58,264,035        |

NO: 2C.1B  
NAME: GROUND & LAUNCH OPERATIONS - ETR

|      |         |         |           |           |           |         |         |  |           |            |
|------|---------|---------|-----------|-----------|-----------|---------|---------|--|-----------|------------|
| 1984 | 1,314.2 | 215,530 | 1,739,328 | 2,270,462 | 1,271,969 | 218,060 | 284,767 |  | 5,784,586 | 5,784,586  |
| 1985 | 1,341.1 | 219,941 | 1,774,926 | 2,315,351 | 1,546,915 | 222,520 | 351,771 |  | 6,211,483 | 11,996,069 |
| 1986 | 1,314.2 | 215,530 | 1,739,328 | 2,270,462 | 1,614,814 | 218,060 | 368,522 |  | 6,211,186 | 18,207,255 |
| 1987 | 1,341.1 | 219,941 | 1,774,926 | 2,315,351 | 1,272,719 | 222,520 | 284,767 |  | 5,870,283 | 24,077,538 |
| 1988 | 1,341.1 | 219,941 | 1,774,926 | 2,315,351 | 1,272,719 | 222,520 | 284,767 |  | 5,870,283 | 29,947,821 |
| 1989 | 1,341.1 | 219,941 | 1,774,926 | 2,315,351 | 1,135,621 | 222,520 | 251,265 |  | 5,699,683 | 35,647,504 |
| 1990 | 1,314.2 | 215,530 | 1,739,328 | 2,270,462 | 1,751,812 | 218,060 | 402,024 |  | 6,381,686 | 42,029,190 |
| 1991 | 1,341.1 | 219,941 | 1,774,926 | 2,315,351 | 1,546,915 | 222,520 | 351,771 |  | 6,211,483 | 48,240,673 |

NO: 2C.1C  
NAME: GROUND & LAUNCH OPERATIONS - WTR

|       |          |           |            |            |            |            |           |           |             |           |
|-------|----------|-----------|------------|------------|------------|------------|-----------|-----------|-------------|-----------|
| 1984  | 137.8    | 22,598    | 182,338    | 297,848    | 240,952    | 88,468     | 33,502    |           | 843,108     | 843,108   |
| 1985  | 110.9    | 18,187    | 146,741    | 217,702    | 171,652    | 51,206     | 16,751    |           | 604,052     | 1,447,160 |
| 1986  | 137.8    | 22,598    | 182,338    | 297,848    | 240,952    | 88,468     | 33,502    |           | 843,108     | 2,290,268 |
| 1987  | 110.9    | 18,187    | 146,741    | 217,702    | 171,652    | 51,206     | 16,751    |           | 604,052     | 2,894,320 |
| 1988  | 110.9    | 18,187    | 146,741    | 217,702    | 171,652    | 51,206     | 16,751    |           | 604,052     | 3,498,372 |
| 1989  | 110.9    | 18,187    | 146,741    | 217,702    | 171,652    | 51,206     | 16,751    |           | 604,052     | 4,102,424 |
| 1990  | 137.8    | 22,598    | 182,338    | 297,848    | 240,952    | 88,468     | 33,502    |           | 843,108     | 4,945,532 |
| 1991  | 110.9    | 18,187    | 146,741    | 217,702    | 171,652    | 51,206     | 16,751    |           | 604,052     | 5,549,584 |
| PROP. |          |           |            |            |            |            |           |           |             |           |
| TOTAL | 19,401.6 | 3,181,824 | 28,383,769 | 34,681,659 | 30,488,395 | 14,023,058 | 2,763,915 | 1,713,496 | 112,054,292 |           |

Operation - Cost By Level 4 WBS By Project Function By Year



OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY LEVEL 4 WBS BY PROJECT FUNCTION BY YEAR

NO: 2C.1A.01  
NAME: PROJECT MANAGEMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GPE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 1984  | 396.0      | 64,944    | 661,764    | 727,932       |               | 52,620            |     |       | 1,442,316    | 1,442,316         |
| 1985  | 396.0      | 64,944    | 661,764    | 727,932       |               | 52,620            |     |       | 1,442,316    | 2,884,632         |
| 1986  | 396.0      | 64,944    | 661,764    | 727,932       |               | 52,620            |     |       | 1,442,316    | 4,326,948         |
| 1987  | 396.0      | 64,944    | 661,764    | 727,932       |               | 52,620            |     |       | 1,442,316    | 5,769,264         |
| 1988  | 396.0      | 64,944    | 661,764    | 727,932       |               | 52,620            |     |       | 1,442,316    | 7,211,580         |
| 1989  | 396.0      | 64,944    | 661,764    | 727,932       |               | 52,620            |     |       | 1,442,316    | 8,653,896         |
| 1990  | 396.0      | 64,944    | 661,764    | 727,932       |               | 52,620            |     |       | 1,442,316    | 10,096,212        |
| 1991  | 396.0      | 64,944    | 661,764    | 727,932       |               | 52,620            |     |       | 1,442,316    | 11,538,528        |

NO: 2C.1A.02  
NAME: SYSTEMS ENGINEERING & INTEGRATION

|      |       |        |         |         |  |        |  |  |           |            |
|------|-------|--------|---------|---------|--|--------|--|--|-----------|------------|
| 1984 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 1,486,044  |
| 1985 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 2,972,088  |
| 1986 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 4,458,132  |
| 1987 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 5,944,176  |
| 1988 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 7,430,220  |
| 1989 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 8,916,264  |
| 1990 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 10,402,308 |
| 1991 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 11,888,352 |

NO: 2C.1A.05  
NAME: LOGISTICS

|      |       |        |         |         |           |         |  |  |           |            |
|------|-------|--------|---------|---------|-----------|---------|--|--|-----------|------------|
| 1984 | 156.0 | 25,584 | 260,700 | 286,776 | 2,014,437 | 100,724 |  |  | 2,662,637 | 2,662,637  |
| 1985 | 144.0 | 23,616 | 240,648 | 264,720 | 2,332,506 | 59,128  |  |  | 2,897,002 | 5,559,639  |
| 1986 | 126.0 | 20,664 | 210,576 | 231,648 | 2,544,552 | 96,728  |  |  | 3,083,504 | 8,643,143  |
| 1987 | 126.0 | 20,664 | 210,576 | 231,648 | 1,908,414 | 56,728  |  |  | 2,407,366 | 11,050,509 |
| 1988 | 126.0 | 20,664 | 210,576 | 231,648 | 1,908,414 | 56,728  |  |  | 2,407,366 | 13,457,875 |
| 1989 | 126.0 | 20,664 | 210,576 | 231,648 | 1,696,368 | 56,728  |  |  | 2,195,320 | 15,653,195 |
| 1990 | 126.0 | 20,664 | 210,576 | 231,648 | 2,756,598 | 96,728  |  |  | 3,295,550 | 18,948,745 |
| 1991 | 126.0 | 20,664 | 210,576 | 231,648 | 2,332,506 | 56,728  |  |  | 2,831,458 | 21,780,203 |

OPERATIONS - JUG LAUNCH SITE SUPPORT  
733-ROO  
COST BY LEVEL 4 WBS BY PROJECT FUNCTION BY YEAR

NO: 2C.1A.15  
NAME: SOFTWARE

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/G COST | OTHER DIR CHARGES | GPE | M & A   | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|---------|--------------|-------------------|
| 1984  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 1,632,119         |
| 1985  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 3,264,238         |
| 1986  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 4,896,357         |
| 1987  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 6,528,476         |
| 1988  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 8,160,595         |
| 1989  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 9,792,714         |
| 1990  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 11,424,833        |
| 1991  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 13,056,952        |

NO: 2C.1B.01  
NAME: SITE MANAGEMENT (ETR)

|      |      |        |        |         |       |        |  |  |         |           |
|------|------|--------|--------|---------|-------|--------|--|--|---------|-----------|
| 1984 | 72.0 | 11,808 | 95,292 | 120,180 | 2,016 | 11,940 |  |  | 229,428 | 229,428   |
| 1985 | 72.0 | 11,808 | 95,292 | 120,180 | 2,016 | 11,940 |  |  | 229,428 | 458,856   |
| 1986 | 72.0 | 11,808 | 95,292 | 120,180 | 2,016 | 11,940 |  |  | 229,428 | 688,284   |
| 1987 | 72.0 | 11,808 | 95,292 | 120,180 | 2,016 | 11,940 |  |  | 229,428 | 917,712   |
| 1988 | 72.0 | 11,808 | 95,292 | 120,180 | 2,016 | 11,940 |  |  | 229,428 | 1,147,140 |
| 1989 | 72.0 | 11,808 | 95,292 | 120,180 | 2,016 | 11,940 |  |  | 229,428 | 1,376,568 |
| 1990 | 72.0 | 11,808 | 95,292 | 120,180 | 2,016 | 11,940 |  |  | 229,428 | 1,605,996 |
| 1991 | 72.0 | 11,808 | 95,292 | 120,180 | 2,016 | 11,940 |  |  | 229,428 | 1,835,424 |

NO: 2C.1B.06  
NAME: FACILITIES - ETR

|      |       |        |         |         |        |        |  |  |           |           |
|------|-------|--------|---------|---------|--------|--------|--|--|-----------|-----------|
| 1984 | 312.0 | 51,168 | 412,920 | 597,728 | 78,688 | 51,768 |  |  | 1,141,104 | 1,141,104 |
| 1985 | 312.0 | 51,168 | 412,920 | 597,728 | 78,688 | 51,768 |  |  | 1,141,104 | 2,282,208 |
| 1986 | 312.0 | 51,168 | 412,920 | 597,728 | 78,688 | 51,768 |  |  | 1,141,104 | 3,423,312 |
| 1987 | 312.0 | 51,168 | 412,920 | 597,728 | 78,688 | 51,768 |  |  | 1,141,104 | 4,564,416 |
| 1988 | 312.0 | 51,168 | 412,920 | 597,728 | 78,688 | 51,768 |  |  | 1,141,104 | 5,705,520 |
| 1989 | 312.0 | 51,168 | 412,920 | 597,728 | 78,688 | 51,768 |  |  | 1,141,104 | 6,846,624 |
| 1990 | 312.0 | 51,168 | 412,920 | 597,728 | 78,688 | 51,768 |  |  | 1,141,104 | 7,987,728 |
| 1991 | 312.0 | 51,168 | 412,920 | 597,728 | 78,688 | 51,768 |  |  | 1,141,104 | 9,128,832 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY LEVEL 4 WBS BY PROJECT FUNCTION BY YEAR

NO: 2C.1B.07  
NAME: GROUND SUPPORT EQUIPMENT - ETR

| MO/YR                         | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------------------------------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 1984                          | 84.0       | 13,776    | 111,168    | 140,196       | 2,340         | 13,944            |     |       |              |                   |
| 1985                          | 84.0       | 13,776    | 111,168    | 140,196       | 2,340         | 13,944            |     |       | 267,648      | 267,648           |
| 1986                          | 84.0       | 13,776    | 111,168    | 140,196       | 2,340         | 13,944            |     |       | 267,648      | 535,296           |
| 1987                          | 84.0       | 13,776    | 111,168    | 140,196       | 2,340         | 13,944            |     |       | 267,648      | 802,944           |
| 1988                          | 84.0       | 13,776    | 111,168    | 140,196       | 2,340         | 13,944            |     |       | 267,648      | 1,070,592         |
| 1989                          | 84.0       | 13,776    | 111,168    | 140,196       | 2,340         | 13,944            |     |       | 267,648      | 1,338,240         |
| 1990                          | 84.0       | 13,776    | 111,168    | 140,196       | 2,340         | 13,944            |     |       | 267,648      | 1,605,888         |
| 1991                          | 84.0       | 13,776    | 111,168    | 140,196       | 2,340         | 13,944            |     |       | 267,648      | 1,873,536         |
| NO: 2C.1B.10                  |            |           |            |               |               |                   |     |       | 267,648      | 2,141,184         |
| NAME: LAUNCH OPERATIONS - ETR |            |           |            |               |               |                   |     |       |              |                   |

|   |       |        |         |         |        |        |         |  |           |            |
|---|-------|--------|---------|---------|--------|--------|---------|--|-----------|------------|
| 1984                                    | 395.4 | 64,846 | 523,316 | 659,920 | 11,026 | 65,606 | 284,767 |  | 1,544,635 | 1,544,635  |
| 1985                                    | 413.7 | 67,847 | 547,534 | 690,458 | 11,537 | 68,641 | 351,771 |  | 1,669,941 | 3,214,576  |
| 1986                                    | 395.4 | 64,846 | 523,316 | 659,920 | 11,026 | 65,606 | 368,522 |  | 1,628,390 | 4,842,966  |
| 1987                                    | 413.7 | 67,847 | 547,534 | 690,458 | 11,537 | 68,641 | 284,767 |  | 1,602,937 | 6,445,903  |
| 1988                                    | 413.7 | 67,847 | 547,534 | 690,458 | 11,537 | 68,641 | 284,767 |  | 1,602,937 | 8,048,840  |
| 1989                                    | 413.7 | 67,847 | 547,534 | 690,458 | 11,537 | 68,641 | 251,265 |  | 1,569,435 | 9,618,275  |
| 1990                                    | 395.4 | 64,846 | 523,316 | 659,920 | 11,026 | 65,606 | 402,024 |  | 1,661,892 | 11,280,167 |
| 1991                                    | 413.7 | 67,847 | 547,534 | 690,458 | 11,537 | 68,641 | 351,771 |  | 1,669,941 | 12,950,108 |
| NO: 2C.1B.14                            |       |        |         |         |        |        |         |  |           |            |
| NAME: REFURBISHMENT & INTEGRATION - ETR |       |        |         |         |        |        |         |  |           |            |

|      |       |        |         |         |           |        |  |  |           |            |
|------|-------|--------|---------|---------|-----------|--------|--|--|-----------|------------|
| 1984 | 450.8 | 73,932 | 596,632 | 752,438 | 1,177,899 | 74,802 |  |  |           |            |
| 1985 | 459.4 | 75,342 | 608,012 | 766,789 | 1,452,334 | 76,227 |  |  | 2,601,771 | 2,601,771  |
| 1986 | 450.8 | 73,932 | 596,632 | 752,438 | 1,520,744 | 74,802 |  |  | 2,903,362 | 5,505,133  |
| 1987 | 459.4 | 75,342 | 608,012 | 766,789 | 1,178,138 | 76,227 |  |  | 2,944,616 | 8,449,749  |
| 1988 | 459.4 | 75,342 | 608,012 | 766,789 | 1,178,138 | 76,227 |  |  | 2,629,166 | 11,078,915 |
| 1989 | 459.4 | 75,342 | 608,012 | 766,789 | 1,041,040 | 76,227 |  |  | 2,629,166 | 13,708,081 |
| 1990 | 450.8 | 73,932 | 596,632 | 752,438 | 1,657,742 | 74,802 |  |  | 2,492,068 | 16,200,149 |
| 1991 | 459.4 | 75,342 | 608,012 | 766,789 | 1,452,334 | 76,227 |  |  | 3,081,614 | 19,281,763 |
|      |       |        |         |         |           |        |  |  | 2,903,362 | 22,185,125 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY LEVEL 4 WBS BY PROJECT FUNCTION BY YEAR

NO: 2C.1C.01  
NAME: SITE MANAGEMENT (WTR)

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M & A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-------|--------------|-------------------|
| 1984  | 36.0       | 5,904     | 47,640     | 58,980        | 1,008         | 5,976             |     |       | 113,604      | 113,604           |
| 1985  | 36.0       | 5,904     | 47,640     | 58,980        | 1,008         | 5,976             |     |       | 113,604      | 227,208           |
| 1986  | 36.0       | 5,904     | 47,640     | 58,980        | 1,008         | 5,976             |     |       | 113,604      | 340,812           |
| 1987  | 36.0       | 5,904     | 47,640     | 58,980        | 1,008         | 5,976             |     |       | 113,604      | 454,416           |
| 1988  | 36.0       | 5,904     | 47,640     | 58,980        | 1,008         | 5,976             |     |       | 113,604      | 568,020           |
| 1989  | 36.0       | 5,904     | 47,640     | 58,980        | 1,008         | 5,976             |     |       | 113,604      | 681,624           |
| 1990  | 36.0       | 5,904     | 47,640     | 58,980        | 1,008         | 5,976             |     |       | 113,604      | 795,228           |
| 1991  | 36.0       | 5,904     | 47,640     | 58,980        | 1,008         | 5,976             |     |       | 113,604      | 908,832           |

NO: 2C.1C.06  
NAME: FACILITIES - WTR

|      |      |       |        |        |        |       |  |  |         |           |
|------|------|-------|--------|--------|--------|-------|--|--|---------|-----------|
| 1984 | 24.0 | 3,936 | 31,752 | 39,288 | 80,672 | 3,984 |  |  | 155,696 | 155,696   |
| 1985 | 24.0 | 3,936 | 31,752 | 39,288 | 80,672 | 3,984 |  |  | 155,696 | 311,392   |
| 1986 | 24.0 | 3,936 | 31,752 | 39,288 | 80,672 | 3,984 |  |  | 155,696 | 467,088   |
| 1987 | 24.0 | 3,936 | 31,752 | 39,288 | 80,672 | 3,984 |  |  | 155,696 | 622,784   |
| 1988 | 24.0 | 3,936 | 31,752 | 39,288 | 80,672 | 3,984 |  |  | 155,696 | 778,480   |
| 1989 | 24.0 | 3,936 | 31,752 | 39,288 | 80,672 | 3,984 |  |  | 155,696 | 934,176   |
| 1990 | 24.0 | 3,936 | 31,752 | 39,288 | 80,672 | 3,984 |  |  | 155,696 | 1,089,872 |
| 1991 | 24.0 | 3,936 | 31,752 | 39,288 | 80,672 | 3,984 |  |  | 155,696 | 1,245,568 |

NO: 2C.1C.07  
NAME: GROUND SUPPORT EQUIPMENT -WTR

|      |      |       |        |        |        |       |  |  |        |         |
|------|------|-------|--------|--------|--------|-------|--|--|--------|---------|
| 1984 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 57,848  |
| 1985 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 115,696 |
| 1986 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 173,544 |
| 1987 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 231,392 |
| 1988 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 289,240 |
| 1989 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 347,088 |
| 1990 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 404,936 |
| 1991 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 462,784 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY LEVEL 4 WBS BY PROJECT FUNCTION BY YEAR

NO: 2C.1C.09  
NAME: LAUNCH OPERATIONS - WTR

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE    | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|--------|-----|--------------|-------------------|
| 1984  | 48.6       | 7,970     | 64,312     | 151,762       | 1,358         | 73,664            | 33,502 |     | 324,598      | 324,598           |
| 1985  | 30.3       | 4,969     | 40,094     | 85,703        | 847           | 37,828            | 16,751 |     | 181,223      | 505,821           |
| 1986  | 48.6       | 7,970     | 64,312     | 151,762       | 1,358         | 73,664            | 33,502 |     | 324,598      | 830,419           |
| 1987  | 30.3       | 4,969     | 40,094     | 85,703        | 847           | 37,828            | 16,751 |     | 181,223      | 1,011,642         |
| 1988  | 30.3       | 4,969     | 40,094     | 85,703        | 847           | 37,828            | 16,751 |     | 181,223      | 1,192,865         |
| 1989  | 30.3       | 4,969     | 40,094     | 85,703        | 847           | 37,828            | 16,751 |     | 181,223      | 1,374,088         |
| 1990  | 48.6       | 7,970     | 64,312     | 151,762       | 1,358         | 73,664            | 33,502 |     | 324,598      | 1,698,686         |
| 1991  | 30.3       | 4,969     | 40,094     | 85,703        | 847           | 37,828            | 16,751 |     | 181,223      | 1,879,909         |

NO: 2C.1C.13  
NAME: REFURBISHMENT & INTEGRATION - WTR

|       |          |           |            |            |            |            |           |           |             |           |
|-------|----------|-----------|------------|------------|------------|------------|-----------|-----------|-------------|-----------|
| 1984  | 17.2     | 2,820     | 22,758     | 28,174     | 137,578    | 2,852      |           |           | 191,362     | 191,362   |
| 1985  | 8.6      | 1,410     | 11,379     | 14,087     | 68,789     | 1,426      |           |           | 95,681      | 287,043   |
| 1986  | 17.2     | 2,820     | 22,758     | 28,174     | 137,578    | 2,852      |           |           | 191,362     | 478,405   |
| 1987  | 8.6      | 1,410     | 11,379     | 14,087     | 68,789     | 1,426      |           |           | 95,681      | 574,086   |
| 1988  | 8.6      | 1,410     | 11,379     | 14,087     | 68,789     | 1,426      |           |           | 95,681      | 669,767   |
| 1989  | 8.6      | 1,410     | 11,379     | 14,087     | 68,789     | 1,426      |           |           | 95,681      | 765,448   |
| 1990  | 17.2     | 2,820     | 22,758     | 28,174     | 137,578    | 2,852      |           |           | 191,362     | 956,810   |
| 1991  | 8.6      | 1,410     | 11,379     | 14,087     | 68,789     | 1,426      |           |           | 95,681      | 1,052,491 |
| PROP. |          |           |            |            |            |            |           |           |             |           |
| TOTAL | 19,401.6 | 3,181,824 | 28,383,769 | 34,681,659 | 30,488,395 | 14,023,058 | 2,763,915 | 1,713,496 | 112,054,292 |           |

Operation - Cost By WBS By Project Function By Year (WBS Level 5)

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1A.01.01  
NAME: COST/PERFORMANCE MANAGEMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | MS&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|------|--------------|-------------------|
| 1984  | 108.0      | 17,712    | 180,480    | 198,528       |               | 14,352            |     |      | 393,360      | 393,360           |
| 1985  | 108.0      | 17,712    | 180,480    | 198,528       |               | 14,352            |     |      | 393,360      | 786,720           |
| 1986  | 108.0      | 17,712    | 180,480    | 198,528       |               | 14,352            |     |      | 393,360      | 1,180,080         |
| 1987  | 108.0      | 17,712    | 180,480    | 198,528       |               | 14,352            |     |      | 393,360      | 1,573,440         |
| 1988  | 108.0      | 17,712    | 180,480    | 198,528       |               | 14,352            |     |      | 393,360      | 1,966,800         |
| 1989  | 108.0      | 17,712    | 180,480    | 198,528       |               | 14,352            |     |      | 393,360      | 2,360,160         |
| 1990  | 108.0      | 17,712    | 180,480    | 198,528       |               | 14,352            |     |      | 393,360      | 2,753,520         |
| 1991  | 108.0      | 17,712    | 180,480    | 198,528       |               | 14,352            |     |      | 393,360      | 3,146,880         |

NO: 2C.1A.01.02  
NAME: PROJECT DIRECTION

|      |      |       |        |        |  |       |  |  |         |           |
|------|------|-------|--------|--------|--|-------|--|--|---------|-----------|
| 1984 | 36.0 | 5,904 | 60,156 | 66,168 |  | 4,788 |  |  | 131,112 | 131,112   |
| 1985 | 36.0 | 5,904 | 60,156 | 66,168 |  | 4,788 |  |  | 131,112 | 262,224   |
| 1986 | 36.0 | 5,904 | 60,156 | 66,168 |  | 4,788 |  |  | 131,112 | 393,336   |
| 1987 | 36.0 | 5,904 | 60,156 | 66,168 |  | 4,788 |  |  | 131,112 | 524,448   |
| 1988 | 36.0 | 5,904 | 60,156 | 66,168 |  | 4,788 |  |  | 131,112 | 655,560   |
| 1989 | 36.0 | 5,904 | 60,156 | 66,168 |  | 4,788 |  |  | 131,112 | 786,672   |
| 1990 | 36.0 | 5,904 | 60,156 | 66,168 |  | 4,788 |  |  | 131,112 | 917,784   |
| 1991 | 36.0 | 5,904 | 60,156 | 66,168 |  | 4,788 |  |  | 131,112 | 1,048,896 |

NO: 2C.1A.01.03  
NAME: INFORMATION MANAGEMENT

|      |       |        |         |         |  |        |  |  |         |           |
|------|-------|--------|---------|---------|--|--------|--|--|---------|-----------|
| 1984 | 108.0 | 17,712 | 180,480 | 198,528 |  | 14,352 |  |  | 393,360 | 393,360   |
| 1985 | 108.0 | 17,712 | 180,480 | 198,528 |  | 14,352 |  |  | 393,360 | 786,720   |
| 1986 | 108.0 | 17,712 | 180,480 | 198,528 |  | 14,352 |  |  | 393,360 | 1,180,080 |
| 1987 | 108.0 | 17,712 | 180,480 | 198,528 |  | 14,352 |  |  | 393,360 | 1,573,440 |
| 1988 | 108.0 | 17,712 | 180,480 | 198,528 |  | 14,352 |  |  | 393,360 | 1,966,800 |
| 1989 | 108.0 | 17,712 | 180,480 | 198,528 |  | 14,352 |  |  | 393,360 | 2,360,160 |
| 1990 | 108.0 | 17,712 | 180,480 | 198,528 |  | 14,352 |  |  | 393,360 | 2,753,520 |
| 1991 | 108.0 | 17,712 | 180,480 | 198,528 |  | 14,352 |  |  | 393,360 | 3,146,880 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1A.01.04  
NAME: FLEET UTILIZATION

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-----|--------------|-------------------|
| 1984  | 144.0      | 23,616    | 240,648    | 264,708       |               | 19,128            |     |     | 524,484      | 524,484           |
| 1985  | 144.0      | 23,616    | 240,648    | 264,708       |               | 19,128            |     |     | 524,484      | 1,048,968         |
| 1986  | 144.0      | 23,616    | 240,648    | 264,708       |               | 19,128            |     |     | 524,484      | 1,573,452         |
| 1987  | 144.0      | 23,616    | 240,648    | 264,708       |               | 19,128            |     |     | 524,484      | 2,097,936         |
| 1988  | 144.0      | 23,616    | 240,648    | 264,708       |               | 19,128            |     |     | 524,484      | 2,622,420         |
| 1989  | 144.0      | 23,616    | 240,648    | 264,708       |               | 19,128            |     |     | 524,484      | 3,146,904         |
| 1990  | 144.0      | 23,616    | 240,648    | 264,708       |               | 19,128            |     |     | 524,484      | 3,671,388         |
| 1991  | 144.0      | 23,616    | 240,648    | 264,708       |               | 19,128            |     |     | 524,484      | 4,195,872         |

NO: 2C.1A.02.04  
NAME: SUSTAINING ENGINEERING

|      |       |        |         |         |  |        |  |  |           |            |
|------|-------|--------|---------|---------|--|--------|--|--|-----------|------------|
| 1984 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 1,486,044  |
| 1985 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 2,972,088  |
| 1986 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 4,458,132  |
| 1987 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 5,944,176  |
| 1988 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 7,430,220  |
| 1989 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 8,916,264  |
| 1990 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 10,402,308 |
| 1991 | 408.0 | 66,912 | 681,828 | 750,012 |  | 54,204 |  |  | 1,486,044 | 11,888,352 |

NO: 2C.1A.05.01  
NAME: TRANSPORTATION & HANDLING

|      |      |       |        |        |  |        |  |  |         |           |
|------|------|-------|--------|--------|--|--------|--|--|---------|-----------|
| 1984 | 24.0 | 3,936 | 40,104 | 44,112 |  | 83,192 |  |  | 167,408 | 167,408   |
| 1985 | 24.0 | 3,936 | 40,104 | 44,112 |  | 83,192 |  |  | 127,408 | 294,816   |
| 1986 | 24.0 | 3,936 | 40,104 | 44,112 |  | 83,192 |  |  | 167,408 | 462,224   |
| 1987 | 24.0 | 3,936 | 40,104 | 44,112 |  | 83,192 |  |  | 127,408 | 589,632   |
| 1988 | 24.0 | 3,936 | 40,104 | 44,112 |  | 83,192 |  |  | 127,408 | 717,040   |
| 1989 | 24.0 | 3,936 | 40,104 | 44,112 |  | 83,192 |  |  | 127,408 | 844,448   |
| 1990 | 24.0 | 3,936 | 40,104 | 44,112 |  | 83,192 |  |  | 167,408 | 1,011,856 |
| 1991 | 24.0 | 3,936 | 40,104 | 44,112 |  | 83,192 |  |  | 127,408 | 1,139,264 |



OPERATIONS - TUG LAUNCH SITE SUPPORT  
732-R00  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1A.05.02  
NAME: TRAINING

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-----|--------------|-------------------|
| 1984  | 48.0       | 7,872     | 80,220     | 88,248        |               | 6,372             |     |     | 174,840      | 174,840           |
| 1985  | 48.0       | 7,872     | 80,220     | 88,248        |               | 6,372             |     |     | 174,840      | 349,680           |
| 1986  | 48.0       | 7,872     | 80,220     | 88,248        |               | 6,372             |     |     | 174,840      | 524,520           |
| 1987  | 48.0       | 7,872     | 80,220     | 88,248        |               | 6,372             |     |     | 174,840      | 699,360           |
| 1988  | 48.0       | 7,872     | 80,220     | 88,248        |               | 6,372             |     |     | 174,840      | 874,200           |
| 1989  | 48.0       | 7,872     | 80,220     | 88,248        |               | 6,372             |     |     | 174,840      | 1,049,040         |
| 1990  | 48.0       | 7,872     | 80,220     | 88,248        |               | 6,372             |     |     | 174,840      | 1,223,880         |
| 1991  | 48.0       | 7,872     | 80,220     | 88,248        |               | 6,372             |     |     | 174,840      | 1,398,720         |

NO: 2C.1A.05.03  
NAME: INVENTORY CONTROL & WAREHOUSING

|      |      |        |         |         |  |       |  |  |         |           |
|------|------|--------|---------|---------|--|-------|--|--|---------|-----------|
| 1984 | 72.0 | 11,808 | 120,324 | 132,360 |  | 9,564 |  |  | 262,248 | 262,248   |
| 1985 | 60.0 | 9,840  | 100,272 | 110,304 |  | 7,968 |  |  | 218,544 | 480,792   |
| 1986 | 48.0 | 7,872  | 80,220  | 88,248  |  | 6,372 |  |  | 174,840 | 655,632   |
| 1987 | 48.0 | 7,872  | 80,220  | 88,248  |  | 6,372 |  |  | 174,840 | 830,472   |
| 1988 | 48.0 | 7,872  | 80,220  | 88,248  |  | 6,372 |  |  | 174,840 | 1,005,312 |
| 1989 | 48.0 | 7,872  | 80,220  | 88,248  |  | 6,372 |  |  | 174,840 | 1,180,152 |
| 1990 | 48.0 | 7,872  | 80,220  | 88,248  |  | 6,372 |  |  | 174,840 | 1,354,992 |
| 1991 | 48.0 | 7,872  | 80,220  | 88,248  |  | 6,372 |  |  | 174,840 | 1,529,832 |

NO: 2C.1A.05.04  
NAME: DEPOT MAINTENANCE

|      |      |       |        |        |           |       |  |  |           |            |
|------|------|-------|--------|--------|-----------|-------|--|--|-----------|------------|
| 1984 | 12.0 | 1,968 | 20,052 | 22,056 | 2,014,437 | 1,596 |  |  | 2,058,141 | 2,058,141  |
| 1985 | 12.0 | 1,968 | 20,052 | 22,056 | 2,332,506 | 1,596 |  |  | 2,376,210 | 4,434,351  |
| 1986 | 6.0  | 984   | 10,032 | 11,040 | 2,544,552 | 792   |  |  | 2,566,416 | 7,000,767  |
| 1987 | 6.0  | 984   | 10,032 | 11,040 | 1,908,414 | 792   |  |  | 1,930,278 | 8,931,045  |
| 1988 | 6.0  | 984   | 10,032 | 11,040 | 1,908,414 | 792   |  |  | 1,930,278 | 10,861,323 |
| 1989 | 6.0  | 984   | 10,032 | 11,040 | 1,696,368 | 792   |  |  | 1,718,232 | 12,579,555 |
| 1990 | 6.0  | 984   | 10,032 | 11,040 | 2,756,598 | 792   |  |  | 2,778,462 | 15,358,017 |
| 1991 | 6.0  | 984   | 10,032 | 11,040 | 2,332,506 | 792   |  |  | 2,354,370 | 17,712,387 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1A.15.03  
NAME: GSE SOFTWARE

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M&A     | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|---------|--------------|-------------------|
| 1984  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 1,632,119         |
| 1985  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 3,264,238         |
| 1986  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 4,896,357         |
| 1987  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 6,528,476         |
| 1988  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 8,160,595         |
| 1989  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 9,792,714         |
| 1990  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 11,424,833        |
| 1991  | 37.2       | 6,096     | 62,112     | 68,316        |               | 1,287,504         |     | 214,187 | 1,632,119    | 13,056,952        |

NO: 2C.1B.01.02  
NAME: PROJECT MANAGEMENT

|      |      |       |        |        |       |       |  |  |         |           |
|------|------|-------|--------|--------|-------|-------|--|--|---------|-----------|
| 1984 | 48.0 | 7,872 | 63,528 | 80,100 | 1,344 | 7,956 |  |  | 152,928 | 152,928   |
| 1985 | 48.0 | 7,872 | 63,528 | 80,100 | 1,344 | 7,956 |  |  | 152,928 | 305,856   |
| 1986 | 48.0 | 7,872 | 63,528 | 80,100 | 1,344 | 7,956 |  |  | 152,928 | 458,784   |
| 1987 | 48.0 | 7,872 | 63,528 | 80,100 | 1,344 | 7,956 |  |  | 152,928 | 611,712   |
| 1988 | 48.0 | 7,872 | 63,528 | 80,100 | 1,344 | 7,956 |  |  | 152,928 | 764,640   |
| 1989 | 48.0 | 7,872 | 63,528 | 80,100 | 1,344 | 7,956 |  |  | 152,928 | 917,568   |
| 1990 | 48.0 | 7,872 | 63,528 | 80,100 | 1,344 | 7,956 |  |  | 152,928 | 1,070,496 |
| 1991 | 48.0 | 7,872 | 63,528 | 80,100 | 1,344 | 7,956 |  |  | 152,928 | 1,223,424 |

NO: 2C.1B.01.03  
NAME: INFORMATION MANAGEMENT

|      |      |       |        |        |     |       |  |  |        |         |
|------|------|-------|--------|--------|-----|-------|--|--|--------|---------|
| 1984 | 24.0 | 3,936 | 31,764 | 40,080 | 672 | 3,984 |  |  | 76,500 | 76,500  |
| 1985 | 24.0 | 3,936 | 31,764 | 40,080 | 672 | 3,984 |  |  | 76,500 | 153,000 |
| 1986 | 24.0 | 3,936 | 31,764 | 40,080 | 672 | 3,984 |  |  | 76,500 | 229,500 |
| 1987 | 24.0 | 3,936 | 31,764 | 40,080 | 672 | 3,984 |  |  | 76,500 | 306,000 |
| 1988 | 24.0 | 3,936 | 31,764 | 40,080 | 672 | 3,984 |  |  | 76,500 | 382,500 |
| 1989 | 24.0 | 3,936 | 31,764 | 40,080 | 672 | 3,984 |  |  | 76,500 | 459,000 |
| 1990 | 24.0 | 3,936 | 31,764 | 40,080 | 672 | 3,984 |  |  | 76,500 | 535,500 |
| 1991 | 24.0 | 3,936 | 31,764 | 40,080 | 672 | 3,984 |  |  | 76,500 | 612,000 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1B.06.03  
NAME: ETR MAINTENANCE & REFURBISHMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-----|--------------|-------------------|
| 1984  | 156.0      | 25,584    | 206,460    | 337,364       | 74,344        | 25,884            |     |     | 644,052      | 644,052           |
| 1985  | 156.0      | 25,584    | 206,460    | 337,364       | 74,344        | 25,884            |     |     | 644,052      | 1,288,104         |
| 1986  | 156.0      | 25,584    | 206,460    | 337,364       | 74,344        | 25,884            |     |     | 644,052      | 1,932,156         |
| 1987  | 156.0      | 25,584    | 206,460    | 337,364       | 74,344        | 25,884            |     |     | 644,052      | 2,576,208         |
| 1988  | 156.0      | 25,584    | 206,460    | 337,364       | 74,344        | 25,884            |     |     | 644,052      | 3,220,260         |
| 1989  | 156.0      | 25,584    | 206,460    | 337,364       | 74,344        | 25,884            |     |     | 644,052      | 3,864,312         |
| 1990  | 156.0      | 25,584    | 206,460    | 337,364       | 74,344        | 25,884            |     |     | 644,052      | 4,508,364         |
| 1991  | 156.0      | 25,584    | 206,460    | 337,364       | 74,344        | 25,884            |     |     | 644,052      | 5,152,416         |

NO: 2C.1B.06.07  
NAME: FACILITY OPERATIONS SUPPORT

|      |       |        |         |         |       |        |  |  |         |           |
|------|-------|--------|---------|---------|-------|--------|--|--|---------|-----------|
| 1984 | 156.0 | 25,584 | 206,460 | 260,364 | 4,344 | 25,884 |  |  | 497,052 | 497,052   |
| 1985 | 156.0 | 25,584 | 206,460 | 260,364 | 4,344 | 25,884 |  |  | 497,052 | 994,104   |
| 1986 | 156.0 | 25,584 | 206,460 | 260,364 | 4,344 | 25,884 |  |  | 497,052 | 1,491,156 |
| 1987 | 156.0 | 25,584 | 206,460 | 260,364 | 4,344 | 25,884 |  |  | 497,052 | 1,988,208 |
| 1988 | 156.0 | 25,584 | 206,460 | 260,364 | 4,344 | 25,884 |  |  | 497,052 | 2,485,260 |
| 1989 | 156.0 | 25,584 | 206,460 | 260,364 | 4,344 | 25,884 |  |  | 497,052 | 2,982,312 |
| 1990 | 156.0 | 25,584 | 206,460 | 260,364 | 4,344 | 25,884 |  |  | 497,052 | 3,479,364 |
| 1991 | 156.0 | 25,584 | 206,460 | 260,364 | 4,344 | 25,884 |  |  | 497,052 | 3,976,416 |

NO: 2C.1B.07.02  
NAME: EASTERN TEST RANGE - GSE

|      |      |        |         |         |       |        |  |  |         |           |
|------|------|--------|---------|---------|-------|--------|--|--|---------|-----------|
| 1984 | 84.0 | 13,776 | 111,168 | 140,196 | 2,340 | 13,944 |  |  | 267,648 | 267,648   |
| 1985 | 84.0 | 13,776 | 111,168 | 140,196 | 2,340 | 13,944 |  |  | 267,648 | 535,296   |
| 1986 | 84.0 | 13,776 | 111,168 | 140,196 | 2,340 | 13,944 |  |  | 267,648 | 802,944   |
| 1987 | 84.0 | 13,776 | 111,168 | 140,196 | 2,340 | 13,944 |  |  | 267,648 | 1,070,592 |
| 1988 | 84.0 | 13,776 | 111,168 | 140,196 | 2,340 | 13,944 |  |  | 267,648 | 1,338,240 |
| 1989 | 84.0 | 13,776 | 111,168 | 140,196 | 2,340 | 13,944 |  |  | 267,648 | 1,605,888 |
| 1990 | 84.0 | 13,776 | 111,168 | 140,196 | 2,340 | 13,944 |  |  | 267,648 | 1,873,536 |
| 1991 | 84.0 | 13,776 | 111,168 | 140,196 | 2,340 | 13,944 |  |  | 267,648 | 2,141,184 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1B.10.01  
NAME: LAUNCH SITE SERVICES/SUPPORT

| NO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-----|--------------|-------------------|
| 1984  | 48.0       | 7,872     | 63,528     | 80,100        | 1,344         | 7,956             |     |     | 152,928      | 152,928           |
| 1985  | 48.0       | 7,872     | 63,528     | 80,100        | 1,344         | 7,956             |     |     | 152,928      | 305,856           |
| 1986  | 48.0       | 7,872     | 63,528     | 80,100        | 1,344         | 7,956             |     |     | 152,928      | 458,784           |
| 1987  | 48.0       | 7,872     | 63,528     | 80,100        | 1,344         | 7,956             |     |     | 152,928      | 611,712           |
| 1988  | 48.0       | 7,872     | 63,528     | 80,100        | 1,344         | 7,956             |     |     | 152,928      | 764,640           |
| 1989  | 48.0       | 7,872     | 63,528     | 80,100        | 1,344         | 7,956             |     |     | 152,928      | 917,568           |
| 1990  | 48.0       | 7,872     | 63,528     | 80,100        | 1,344         | 7,956             |     |     | 152,928      | 1,070,496         |
| 1991  | 48.0       | 7,872     | 63,528     | 80,100        | 1,344         | 7,956             |     |     | 152,928      | 1,223,424         |

NO: 2C.1B.10.02  
NAME: TUG SHUTTLE MATING & CHECKOUT

|      |       |        |         |         |       |        |  |  |         |           |
|------|-------|--------|---------|---------|-------|--------|--|--|---------|-----------|
| 1984 | 168.0 | 27,554 | 222,366 | 280,416 | 4,686 | 27,876 |  |  | 535,344 | 535,344   |
| 1985 | 175.2 | 28,735 | 231,897 | 292,434 | 4,887 | 29,070 |  |  | 558,288 | 1,093,632 |
| 1986 | 168.0 | 27,554 | 222,366 | 280,416 | 4,686 | 27,876 |  |  | 535,344 | 1,628,976 |
| 1987 | 175.2 | 28,735 | 231,897 | 292,434 | 4,887 | 29,070 |  |  | 558,288 | 2,187,264 |
| 1988 | 175.2 | 28,735 | 231,897 | 292,434 | 4,887 | 29,070 |  |  | 558,288 | 2,745,552 |
| 1989 | 175.2 | 28,735 | 231,897 | 292,434 | 4,887 | 29,070 |  |  | 558,288 | 3,303,840 |
| 1990 | 168.0 | 27,554 | 222,366 | 280,416 | 4,686 | 27,876 |  |  | 535,344 | 3,839,184 |
| 1991 | 175.2 | 28,735 | 231,897 | 292,434 | 4,887 | 29,070 |  |  | 558,288 | 4,397,472 |

NO: 2C.1B.10.03  
NAME: PRELAUNCH CHECKOUT & COUNTDOWN

|      |      |       |        |        |       |       |  |  |         |           |
|------|------|-------|--------|--------|-------|-------|--|--|---------|-----------|
| 1984 | 54.4 | 8,924 | 72,020 | 90,820 | 1,516 | 9,030 |  |  | 173,386 | 173,386   |
| 1985 | 58.4 | 9,580 | 77,314 | 97,496 | 1,628 | 9,693 |  |  | 186,131 | 359,517   |
| 1986 | 54.4 | 8,924 | 72,020 | 90,820 | 1,516 | 9,030 |  |  | 173,386 | 532,903   |
| 1987 | 58.4 | 9,580 | 77,314 | 97,496 | 1,628 | 9,693 |  |  | 186,131 | 719,034   |
| 1988 | 58.4 | 9,580 | 77,314 | 97,496 | 1,628 | 9,693 |  |  | 186,131 | 905,165   |
| 1989 | 58.4 | 9,580 | 77,314 | 97,496 | 1,628 | 9,693 |  |  | 186,131 | 1,091,296 |
| 1990 | 54.4 | 8,924 | 72,020 | 90,820 | 1,516 | 9,030 |  |  | 173,386 | 1,264,682 |
| 1991 | 58.4 | 9,580 | 77,314 | 97,496 | 1,628 | 9,693 |  |  | 186,131 | 1,450,813 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-ROG  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1B.10.04  
NAME: PROPELLANTS & GASES

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE     | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|---------|-----|--------------|-------------------|
| 1984  |            |           |            |               |               |                   | 284,767 |     | 284,767      | 284,767           |
| 1985  |            |           |            |               |               |                   | 351,771 |     | 351,771      | 636,538           |
| 1986  |            |           |            |               |               |                   | 368,522 |     | 368,522      | 1,005,060         |
| 1987  |            |           |            |               |               |                   | 284,767 |     | 284,767      | 1,289,827         |
| 1988  |            |           |            |               |               |                   | 284,767 |     | 284,767      | 1,574,594         |
| 1989  |            |           |            |               |               |                   | 251,265 |     | 251,265      | 1,825,859         |
| 1990  |            |           |            |               |               |                   | 402,024 |     | 402,024      | 2,227,883         |
| 1991  |            |           |            |               |               |                   | 351,771 |     | 351,771      | 2,579,654         |

NO: 2C.1B.10.05  
NAME: POSTFLIGHT SAFING

|      |       |        |         |         |       |        |  |  |         |           |
|------|-------|--------|---------|---------|-------|--------|--|--|---------|-----------|
| 1984 | 125.0 | 20,496 | 165,402 | 208,584 | 3,480 | 20,744 |  |  | 398,210 | 398,210   |
| 1985 | 132.1 | 21,660 | 174,795 | 220,428 | 3,678 | 21,922 |  |  | 420,823 | 819,033   |
| 1986 | 125.0 | 20,496 | 165,402 | 208,584 | 3,480 | 20,744 |  |  | 398,210 | 1,217,243 |
| 1987 | 132.1 | 21,660 | 174,795 | 220,428 | 3,678 | 21,922 |  |  | 420,823 | 1,638,066 |
| 1988 | 132.1 | 21,660 | 174,795 | 220,428 | 3,678 | 21,922 |  |  | 420,823 | 2,058,889 |
| 1989 | 132.1 | 21,660 | 174,795 | 220,428 | 3,678 | 21,922 |  |  | 420,823 | 2,479,712 |
| 1990 | 125.0 | 20,496 | 165,402 | 208,584 | 3,480 | 20,744 |  |  | 398,210 | 2,877,922 |
| 1991 | 132.1 | 21,660 | 174,795 | 220,428 | 3,678 | 21,922 |  |  | 420,823 | 3,298,745 |

NO: 2C.1B.14.01  
NAME: SCHEDULED MAINTENANCE & REFURBISH

|      |       |        |         |         |           |        |  |  |           |            |
|------|-------|--------|---------|---------|-----------|--------|--|--|-----------|------------|
| 1984 | 187.2 | 30,696 | 247,716 | 312,396 | 1,170,553 | 31,056 |  |  | 1,761,721 | 1,761,721  |
| 1985 | 187.2 | 30,696 | 247,716 | 312,396 | 1,444,749 | 31,056 |  |  | 2,035,917 | 3,797,638  |
| 1986 | 187.2 | 30,696 | 247,716 | 312,396 | 1,513,398 | 31,056 |  |  | 2,104,566 | 5,902,204  |
| 1987 | 187.2 | 30,696 | 247,716 | 312,396 | 1,170,553 | 31,056 |  |  | 1,761,721 | 7,663,925  |
| 1988 | 187.2 | 30,696 | 247,716 | 312,396 | 1,170,553 | 31,056 |  |  | 1,761,721 | 9,425,646  |
| 1989 | 187.2 | 30,696 | 247,716 | 312,396 | 1,033,455 | 31,056 |  |  | 1,624,623 | 11,050,269 |
| 1990 | 187.2 | 30,696 | 247,716 | 312,396 | 1,650,396 | 31,056 |  |  | 2,241,564 | 13,291,833 |
| 1991 | 187.2 | 30,696 | 247,716 | 312,396 | 1,444,749 | 31,056 |  |  | 2,035,917 | 15,327,750 |

NO: 2C.1B.14.02  
NAME: UNSCHEDULED MAINTENANCE & REFURBISH

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-----|--------------|-------------------|
| 1984  | 42.0       | 6,888     | 55,584     | 70,116        | 1,176         | 6,972             |     |     | 133,848      | 133,848           |
| 1985  | 42.0       | 6,888     | 55,584     | 70,116        | 1,176         | 6,972             |     |     | 133,848      | 267,696           |
| 1986  | 42.0       | 6,888     | 55,584     | 70,116        | 1,176         | 6,972             |     |     | 133,848      | 401,544           |
| 1987  | 42.0       | 6,888     | 55,584     | 70,116        | 1,176         | 6,972             |     |     | 133,848      | 535,392           |
| 1988  | 42.0       | 6,888     | 55,584     | 70,116        | 1,176         | 6,972             |     |     | 133,848      | 669,240           |
| 1989  | 42.0       | 6,888     | 55,584     | 70,116        | 1,176         | 6,972             |     |     | 133,848      | 803,088           |
| 1990  | 42.0       | 6,888     | 55,584     | 70,116        | 1,176         | 6,972             |     |     | 133,848      | 936,936           |
| 1991  | 42.0       | 6,888     | 55,584     | 70,116        | 1,176         | 6,972             |     |     | 133,848      | 1,070,784         |

NO: 2C.1B.14.03  
NAME: POST MAINTENANCE CHECKOUT

|      |       |        |         |         |       |        |  |  |         |           |
|------|-------|--------|---------|---------|-------|--------|--|--|---------|-----------|
| 1984 | 122.0 | 20,006 | 161,448 | 203,606 | 3,400 | 20,244 |  |  | 388,698 | 388,698   |
| 1985 | 125.8 | 20,629 | 166,476 | 209,947 | 3,506 | 20,874 |  |  | 400,803 | 789,501   |
| 1986 | 122.0 | 20,006 | 161,448 | 203,606 | 3,400 | 20,244 |  |  | 388,698 | 1,178,199 |
| 1987 | 125.8 | 20,629 | 166,476 | 209,947 | 3,506 | 20,874 |  |  | 400,803 | 1,579,002 |
| 1988 | 125.8 | 20,629 | 166,476 | 209,947 | 3,506 | 20,874 |  |  | 400,803 | 1,979,805 |
| 1989 | 125.8 | 20,629 | 166,476 | 209,947 | 3,506 | 20,874 |  |  | 400,803 | 2,380,608 |
| 1990 | 122.0 | 20,006 | 161,448 | 203,606 | 3,400 | 20,244 |  |  | 388,698 | 2,769,306 |
| 1991 | 125.8 | 20,629 | 166,476 | 209,947 | 3,506 | 20,874 |  |  | 400,803 | 3,170,109 |

NO: 2C.1B.14.04  
NAME: TUG/SPACECRAFT MATING & CHECKOUT

|      |      |        |         |         |       |        |  |  |         |           |
|------|------|--------|---------|---------|-------|--------|--|--|---------|-----------|
| 1984 | 80.8 | 13,256 | 106,976 | 134,908 | 2,250 | 13,410 |  |  | 257,544 | 257,544   |
| 1985 | 84.8 | 13,912 | 112,270 | 141,584 | 2,361 | 14,073 |  |  | 270,288 | 527,832   |
| 1986 | 80.8 | 13,256 | 106,976 | 134,908 | 2,250 | 13,410 |  |  | 257,544 | 785,376   |
| 1987 | 84.8 | 13,912 | 112,270 | 141,584 | 2,361 | 14,073 |  |  | 270,288 | 1,055,664 |
| 1988 | 84.8 | 13,912 | 112,270 | 141,584 | 2,361 | 14,073 |  |  | 270,288 | 1,325,952 |
| 1989 | 84.8 | 13,912 | 112,270 | 141,584 | 2,361 | 14,073 |  |  | 270,288 | 1,596,240 |
| 1990 | 80.8 | 13,256 | 106,976 | 134,908 | 2,250 | 13,410 |  |  | 257,544 | 1,853,784 |
| 1991 | 84.8 | 13,912 | 112,270 | 141,584 | 2,361 | 14,073 |  |  | 270,288 | 2,124,072 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1B.14.05  
NAME: REFURBISHMENT REQUIREMENTS PLANNING

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-----|--------------|-------------------|
| 1984  | 18.8       | 3,086     | 24,908     | 31,412        | 520           | 3,120             |     |     | 59,960       | 59,960            |
| 1985  | 19.6       | 3,217     | 25,966     | 32,746        | 542           | 3,252             |     |     | 62,506       | 122,466           |
| 1986  | 18.8       | 3,086     | 24,908     | 31,412        | 520           | 3,120             |     |     | 59,960       | 182,426           |
| 1987  | 19.6       | 3,217     | 25,966     | 32,746        | 542           | 3,252             |     |     | 62,506       | 244,932           |
| 1988  | 19.6       | 3,217     | 25,966     | 32,746        | 542           | 3,252             |     |     | 62,506       | 307,438           |
| 1989  | 19.6       | 3,217     | 25,966     | 32,746        | 542           | 3,252             |     |     | 62,506       | 369,944           |
| 1990  | 18.8       | 3,086     | 24,908     | 31,412        | 520           | 3,120             |     |     | 59,960       | 429,904           |
| 1991  | 19.6       | 3,217     | 25,966     | 32,746        | 542           | 3,252             |     |     | 62,506       | 492,410           |

NO: 2C.1C.01.02  
NAME: PROJECT MANAGEMENT

|      |      |       |        |        |     |       |  |  |        |         |
|------|------|-------|--------|--------|-----|-------|--|--|--------|---------|
| 1984 | 24.0 | 3,936 | 31,764 | 39,336 | 672 | 3,984 |  |  | 75,756 | 75,756  |
| 1985 | 24.0 | 3,936 | 31,764 | 39,336 | 672 | 3,984 |  |  | 75,756 | 151,512 |
| 1986 | 24.0 | 3,936 | 31,764 | 39,336 | 672 | 3,984 |  |  | 75,756 | 227,268 |
| 1987 | 24.0 | 3,936 | 31,764 | 39,336 | 672 | 3,984 |  |  | 75,756 | 303,024 |
| 1988 | 24.0 | 3,936 | 31,764 | 39,336 | 672 | 3,984 |  |  | 75,756 | 378,780 |
| 1989 | 24.0 | 3,936 | 31,764 | 39,336 | 672 | 3,984 |  |  | 75,756 | 454,536 |
| 1990 | 24.0 | 3,936 | 31,764 | 39,336 | 672 | 3,984 |  |  | 75,756 | 530,292 |
| 1991 | 24.0 | 3,936 | 31,764 | 39,336 | 672 | 3,984 |  |  | 75,756 | 606,048 |

NO: 2C.1C.01.03  
NAME: INFORMATION MANAGEMENT

|      |      |       |        |        |     |       |  |  |        |         |
|------|------|-------|--------|--------|-----|-------|--|--|--------|---------|
| 1984 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 37,848  |
| 1985 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 75,696  |
| 1986 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 113,544 |
| 1987 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 151,392 |
| 1988 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 189,240 |
| 1989 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 227,088 |
| 1990 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 264,936 |
| 1991 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 302,784 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1C.06.05  
NAME: WTR MAINTENANCE & REFURBISHMENT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-----|--------------|-------------------|
| 1984  | 12.0       | 1,968     | 15,876     | 19,644        | 80,336        | 1,992             |     |     | 117,848      | 117,848           |
| 1985  | 12.0       | 1,968     | 15,876     | 19,644        | 80,336        | 1,992             |     |     | 117,848      | 235,696           |
| 1986  | 12.0       | 1,968     | 15,876     | 19,644        | 80,336        | 1,992             |     |     | 117,848      | 353,544           |
| 1987  | 12.0       | 1,968     | 15,876     | 19,644        | 80,336        | 1,992             |     |     | 117,848      | 471,392           |
| 1988  | 12.0       | 1,968     | 15,876     | 19,644        | 80,336        | 1,992             |     |     | 117,848      | 589,240           |
| 1989  | 12.0       | 1,968     | 15,876     | 19,644        | 80,336        | 1,992             |     |     | 117,848      | 707,088           |
| 1990  | 12.0       | 1,968     | 15,876     | 19,644        | 80,336        | 1,992             |     |     | 117,848      | 824,936           |
| 1991  | 12.0       | 1,968     | 15,876     | 19,644        | 80,336        | 1,992             |     |     | 117,848      | 942,784           |

NO: 2C.1C.06.08  
NAME: FACILITY OPERATIONS SUPPORT

|      |      |       |        |        |     |       |  |  |        |         |
|------|------|-------|--------|--------|-----|-------|--|--|--------|---------|
| 1984 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 37,848  |
| 1985 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 75,696  |
| 1986 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 113,544 |
| 1987 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 151,392 |
| 1988 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 189,240 |
| 1989 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 227,088 |
| 1990 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 264,936 |
| 1991 | 12.0 | 1,968 | 15,876 | 19,644 | 336 | 1,992 |  |  | 37,848 | 302,784 |

NO: 2C.1C.07.03  
NAME: WESTERN TEST RANGE - GSE

|      |      |       |        |        |        |       |  |  |        |         |
|------|------|-------|--------|--------|--------|-------|--|--|--------|---------|
| 1984 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 57,848  |
| 1985 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 115,696 |
| 1986 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 173,544 |
| 1987 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 231,392 |
| 1988 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 289,240 |
| 1989 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 347,088 |
| 1990 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 404,936 |
| 1991 | 12.0 | 1,968 | 15,876 | 19,644 | 20,336 | 1,992 |  |  | 57,848 | 462,784 |



OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1C.09.01  
NAME: LAUNCH SITE SERVICES/SUPPORT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-----|--------------|-------------------|
| 1984  | 12.0       | 1,968     | 15,876     | 19,644        | 336           | 1,992             |     |     | 37,848       | 37,848            |
| 1985  | 12.0       | 1,968     | 15,876     | 19,644        | 336           | 1,992             |     |     | 37,848       | 75,696            |
| 1986  | 12.0       | 1,968     | 15,876     | 19,644        | 336           | 1,992             |     |     | 37,848       | 113,544           |
| 1987  | 12.0       | 1,968     | 15,876     | 19,644        | 336           | 1,992             |     |     | 37,848       | 151,392           |
| 1988  | 12.0       | 1,968     | 15,876     | 19,644        | 336           | 1,992             |     |     | 37,848       | 189,240           |
| 1989  | 12.0       | 1,968     | 15,876     | 19,644        | 336           | 1,992             |     |     | 37,848       | 227,088           |
| 1990  | 12.0       | 1,968     | 15,876     | 19,644        | 336           | 1,992             |     |     | 37,848       | 264,936           |
| 1991  | 12.0       | 1,968     | 15,876     | 19,644        | 336           | 1,992             |     |     | 37,848       | 302,784           |

NO: 2C.1C.09.02  
NAME: TUG SHUTTLE MATING & CHECKOUT

|      |      |       |        |        |     |        |  |  |         |           |
|------|------|-------|--------|--------|-----|--------|--|--|---------|-----------|
| 1984 | 14.4 | 2,362 | 19,062 | 95,758 | 402 | 67,990 |  |  | 183,212 | 183,212   |
| 1985 | 7.2  | 1,181 | 9,531  | 47,879 | 201 | 33,995 |  |  | 91,606  | 274,818   |
| 1986 | 14.4 | 2,362 | 19,062 | 95,758 | 402 | 67,990 |  |  | 183,212 | 458,030   |
| 1987 | 7.2  | 1,181 | 9,531  | 47,879 | 201 | 33,995 |  |  | 91,606  | 549,636   |
| 1988 | 7.2  | 1,181 | 9,531  | 47,879 | 201 | 33,995 |  |  | 91,606  | 641,242   |
| 1989 | 7.2  | 1,181 | 9,531  | 47,879 | 201 | 33,995 |  |  | 91,606  | 732,848   |
| 1990 | 14.4 | 2,362 | 19,062 | 95,758 | 402 | 67,990 |  |  | 183,212 | 916,060   |
| 1991 | 7.2  | 1,181 | 9,531  | 47,879 | 201 | 33,995 |  |  | 91,606  | 1,007,666 |

NO: 2C.1C.09.03  
NAME: PRELAUNCH CHECKOUT & COUNTDOWN

|      |     |       |        |        |     |       |  |  |        |         |
|------|-----|-------|--------|--------|-----|-------|--|--|--------|---------|
| 1984 | 8.0 | 1,312 | 10,588 | 13,104 | 224 | 1,326 |  |  | 25,242 | 25,242  |
| 1985 | 4.0 | 656   | 5,294  | 6,552  | 112 | 663   |  |  | 12,621 | 37,863  |
| 1986 | 8.0 | 1,312 | 10,588 | 13,104 | 224 | 1,326 |  |  | 25,242 | 63,105  |
| 1987 | 4.0 | 656   | 5,294  | 6,552  | 112 | 663   |  |  | 12,621 | 75,726  |
| 1988 | 4.0 | 656   | 5,294  | 6,552  | 112 | 663   |  |  | 12,621 | 88,347  |
| 1989 | 4.0 | 656   | 5,294  | 6,552  | 112 | 663   |  |  | 12,621 | 100,968 |
| 1990 | 8.0 | 1,312 | 10,588 | 13,104 | 224 | 1,326 |  |  | 25,242 | 126,210 |
| 1991 | 4.0 | 656   | 5,294  | 6,552  | 112 | 663   |  |  | 12,621 | 138,831 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1C.09.04  
NAME: PROPELLANTS & GASES

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/C COST | OTHER DIR CHARGES | GFE    | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|--------|-----|--------------|-------------------|
| 1984  |            |           |            |               |               |                   | 33,502 |     | 33,502       | 33,502            |
| 1985  |            |           |            |               |               |                   | 16,751 |     | 16,751       | 50,253            |
| 1986  |            |           |            |               |               |                   | 33,502 |     | 33,502       | 83,755            |
| 1987  |            |           |            |               |               |                   | 16,751 |     | 16,751       | 100,506           |
| 1988  |            |           |            |               |               |                   | 16,751 |     | 16,751       | 117,257           |
| 1989  |            |           |            |               |               |                   | 16,751 |     | 16,751       | 134,008           |
| 1990  |            |           |            |               |               |                   | 33,502 |     | 33,502       | 167,510           |
| 1991  |            |           |            |               |               |                   | 16,751 |     | 16,751       | 184,261           |

NO: 2C.1C.09.05  
NAME: POSTFLIGHT SAFING

|      |      |       |        |        |     |       |  |  |        |         |
|------|------|-------|--------|--------|-----|-------|--|--|--------|---------|
| 1984 | 14.2 | 2,328 | 18,786 | 23,256 | 396 | 2,356 |  |  | 44,794 | 44,794  |
| 1985 | 7.1  | 1,164 | 9,393  | 11,628 | 198 | 1,178 |  |  | 22,397 | 67,191  |
| 1986 | 14.2 | 2,328 | 18,786 | 23,256 | 396 | 2,356 |  |  | 44,794 | 111,985 |
| 1987 | 7.1  | 1,164 | 9,393  | 11,628 | 198 | 1,178 |  |  | 22,397 | 134,382 |
| 1988 | 7.1  | 1,164 | 9,393  | 11,628 | 198 | 1,178 |  |  | 22,397 | 156,779 |
| 1989 | 7.1  | 1,164 | 9,393  | 11,628 | 198 | 1,178 |  |  | 22,397 | 179,176 |
| 1990 | 14.2 | 2,328 | 18,786 | 23,256 | 396 | 2,356 |  |  | 44,794 | 223,970 |
| 1991 | 7.1  | 1,164 | 9,393  | 11,628 | 198 | 1,178 |  |  | 22,397 | 246,367 |

NO: 2C.1C.13.01  
NAME: SCHEDULED MAINTENANCE & REFURBISH

|      |  |  |  |  |         |  |  |  |         |         |
|------|--|--|--|--|---------|--|--|--|---------|---------|
| 1984 |  |  |  |  | 137,098 |  |  |  | 137,098 | 137,098 |
| 1985 |  |  |  |  | 68,549  |  |  |  | 68,549  | 205,647 |
| 1986 |  |  |  |  | 137,098 |  |  |  | 137,098 | 342,745 |
| 1987 |  |  |  |  | 68,549  |  |  |  | 68,549  | 411,294 |
| 1988 |  |  |  |  | 68,549  |  |  |  | 68,549  | 479,843 |
| 1989 |  |  |  |  | 68,549  |  |  |  | 68,549  | 548,392 |
| 1990 |  |  |  |  | 137,098 |  |  |  | 137,098 | 685,490 |
| 1991 |  |  |  |  | 68,549  |  |  |  | 68,549  | 754,039 |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
COST BY WBS BY PROJECT FUNCTION BY YEAR (WBS LEVEL 5)

NO: 2C.1C.13.03  
NAME: POST MAINTENANCE CHECKOUT

| MO/YR | MAN MONTHS | MAN HOURS | LABOR COST | OVERHEAD COST | MATL/S/G COST | OTHER DIR CHARGES | GPE | M&A | TOTAL AMOUNT | CUMULATIVE AMOUNT |
|-------|------------|-----------|------------|---------------|---------------|-------------------|-----|-----|--------------|-------------------|
| 1984  | 7.6        | 1,246     | 10,056     | 12,452        | 212           | 1,262             |     |     | 23,982       | 23,982            |
| 1985  | 3.8        | 623       | 5,028      | 6,226         | 106           | 631               |     |     | 11,991       | 35,973            |
| 1986  | 7.6        | 1,246     | 10,056     | 12,452        | 212           | 1,262             |     |     | 23,982       | 59,955            |
| 1987  | 3.8        | 623       | 5,028      | 6,226         | 106           | 631               |     |     | 11,991       | 71,946            |
| 1988  | 3.8        | 623       | 5,028      | 6,226         | 106           | 631               |     |     | 11,991       | 83,937            |
| 1989  | 3.8        | 623       | 5,028      | 6,226         | 106           | 631               |     |     | 11,991       | 95,928            |
| 1990  | 7.6        | 1,246     | 10,056     | 12,452        | 212           | 1,262             |     |     | 23,982       | 119,910           |
| 1991  | 3.8        | 623       | 5,028      | 6,226         | 106           | 631               |     |     | 11,991       | 131,901           |

NO: 2C.1C.13.04  
NAME: TUG/SPACECRAFT MATING & CHECKOUT

|      |     |       |        |        |     |       |  |  |        |         |
|------|-----|-------|--------|--------|-----|-------|--|--|--------|---------|
| 1984 | 8.0 | 1,312 | 10,588 | 13,104 | 224 | 1,326 |  |  | 25,242 | 25,242  |
| 1985 | 4.0 | 656   | 5,294  | 6,552  | 112 | 663   |  |  | 12,621 | 37,863  |
| 1986 | 8.0 | 1,312 | 10,588 | 13,104 | 224 | 1,326 |  |  | 25,242 | 63,105  |
| 1987 | 4.0 | 656   | 5,294  | 6,552  | 112 | 663   |  |  | 12,621 | 75,726  |
| 1988 | 4.0 | 656   | 5,294  | 6,552  | 112 | 663   |  |  | 12,621 | 88,347  |
| 1989 | 4.0 | 656   | 5,294  | 6,552  | 112 | 663   |  |  | 12,621 | 100,968 |
| 1990 | 8.0 | 1,312 | 10,588 | 13,104 | 224 | 1,326 |  |  | 25,242 | 126,210 |
| 1991 | 4.0 | 656   | 5,294  | 6,552  | 112 | 663   |  |  | 12,621 | 138,831 |

NO: 2C.1C.13.05  
NAME: REFURBISHMENT REQUIREMENTS PLANNING

|       |          |           |            |            |            |            |           |           |             |        |
|-------|----------|-----------|------------|------------|------------|------------|-----------|-----------|-------------|--------|
| 1984  | 1.6      | 262       | 2,114      | 2,618      | 44         | 264        |           |           | 5,040       | 5,040  |
| 1985  | .8       | 131       | 1,057      | 1,309      | 22         | 132        |           |           | 2,520       | 7,560  |
| 1986  | 1.6      | 262       | 2,114      | 2,618      | 44         | 264        |           |           | 5,040       | 12,600 |
| 1987  | .8       | 131       | 1,057      | 1,309      | 22         | 132        |           |           | 2,520       | 15,120 |
| 1988  | .8       | 131       | 1,057      | 1,309      | 22         | 132        |           |           | 2,520       | 17,640 |
| 1989  | .8       | 131       | 1,057      | 1,309      | 22         | 132        |           |           | 2,520       | 20,160 |
| 1990  | 1.6      | 262       | 2,114      | 2,618      | 44         | 264        |           |           | 5,040       | 25,200 |
| 1991  | .8       | 131       | 1,057      | 1,309      | 22         | 132        |           |           | 2,520       | 27,720 |
| PROP. |          |           |            |            |            |            |           |           |             |        |
| TOTAL | 19,401.6 | 3,181,824 | 28,383,769 | 34,681,659 | 30,488,395 | 14,023,058 | 2,763,915 | 1,713,496 | 112,054,292 |        |

## Operation - Summary of Other Direct Charges By Type By Month

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
SUMMARY OF OTHER DIRECT CHARGES BY TYPE BY MONTH

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| MO/YR      | OTHER DIR<br>CHARGES | WTR LAUNCH<br>TRAVEL | TDY-RELOC<br>& PER DIEM | 747<br>FERRY | CDC 6000 | IBM 370   | KEYPUNCH | MISC.<br>ODC | TOTAL<br>ODC |
|------------|----------------------|----------------------|-------------------------|--------------|----------|-----------|----------|--------------|--------------|
| 01/84      | 4,003                | 32,800               | 27,117                  | 40,000       | 9,390    | 636,000   | 1,170    |              | 750,480      |
| 02/84      | 4,002                |                      | 27,116                  |              |          |           |          |              | 31,118       |
| 03/84      | 4,002                |                      | 27,116                  |              |          |           |          |              | 31,118       |
| 04/84      | 4,002                |                      | 27,116                  |              |          |           |          |              | 31,118       |
| 05/84      | 4,002                |                      | 27,116                  |              |          |           |          |              | 31,118       |
| 06/84      | 4,002                |                      | 27,116                  |              |          |           |          |              | 31,118       |
| 07/84      | 4,003                | 32,800               | 27,117                  | 40,000       |          | 636,000   |          |              | 739,920      |
| 08/84      | 4,002                |                      | 27,116                  |              |          |           |          |              | 31,118       |
| 09/84      | 4,002                |                      | 27,116                  |              |          |           |          |              | 31,118       |
| 10/84      | 4,002                |                      | 27,116                  |              |          |           |          |              | 31,118       |
| 11/84      | 4,002                |                      | 27,116                  |              |          |           |          |              | 31,118       |
| 12/84      | 4,002                |                      | 27,116                  |              |          |           |          |              | 31,118       |
| YEAR TOTAL | 48,026               | 65,600               | 325,394                 | 80,000       | 9,390    | 1,272,000 | 1,170    |              | 1,801,580    |
| 01/85      | 4,003                | 32,800               | 26,984                  | 40,000       | 9,390    | 636,000   | 1,170    |              | 750,347      |
| 02/85      | 4,002                |                      | 26,983                  |              |          |           |          |              | 30,985       |
| 03/85      | 4,002                |                      | 26,983                  |              |          |           |          |              | 30,985       |
| 04/85      | 4,002                |                      | 26,983                  |              |          |           |          |              | 30,985       |
| 05/85      | 4,002                |                      | 26,983                  |              |          |           |          |              | 30,985       |
| 06/85      | 4,002                |                      | 26,983                  |              |          |           |          |              | 30,985       |
| 07/85      | 4,002                |                      | 26,983                  |              |          |           |          |              | 30,985       |
| 08/85      | 4,002                |                      | 26,983                  |              |          | 636,000   |          |              | 666,985      |
| 09/85      | 4,002                |                      | 26,983                  |              |          |           |          |              | 30,985       |
| 10/85      | 4,002                |                      | 26,983                  |              |          |           |          |              | 30,985       |
| 11/85      | 4,002                |                      | 26,983                  |              |          |           |          |              | 30,985       |
| 12/85      | 4,002                |                      | 26,983                  |              |          |           |          |              | 30,985       |
| YEAR TOTAL | 48,025               | 32,800               | 323,797                 | 40,000       | 9,390    | 1,272,000 | 1,170    |              | 1,727,182    |
| 01/86      | 4,003                | 32,800               | 26,784                  | 40,000       | 9,390    | 636,000   | 1,170    |              | 750,147      |
| 02/86      | 4,002                |                      | 26,783                  |              |          |           |          |              | 30,785       |
| 03/86      | 4,002                |                      | 26,783                  |              |          |           |          |              | 30,785       |
| 04/86      | 4,002                |                      | 26,783                  |              |          |           |          |              | 30,785       |
| 05/86      | 4,002                |                      | 26,783                  |              |          |           |          |              | 30,785       |
| 06/86      | 4,002                |                      | 26,783                  |              |          |           |          |              | 30,785       |
| 07/86      | 4,003                | 32,800               | 26,784                  | 40,000       |          | 636,000   |          |              | 739,587      |
| 08/86      | 4,002                |                      | 26,783                  |              |          |           |          |              | 30,785       |
| 09/86      | 4,002                |                      | 26,783                  |              |          |           |          |              | 30,785       |
| 10/86      | 4,002                |                      | 26,783                  |              |          |           |          |              | 30,785       |
| 11/86      | 4,002                |                      | 26,783                  |              |          |           |          |              | 30,785       |
| 12/86      | 4,002                |                      | 26,783                  |              |          |           |          |              | 30,785       |
| YEAR TOTAL | 48,026               | 65,600               | 321,398                 | 80,000       | 9,390    | 1,272,000 | 1,170    |              | 1,797,584    |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
SUMMARY OF OTHER DIRECT CHARGES BY TYPE BY MONTH

| MO/YR      | OTHER DIR<br>CHARGES | WTR LAUNCH<br>TRAVEL | TDY-RELOC<br>&PER DIEM | 747<br>FERRY | CDC 6000 | IBM 370   | KEYPUNCH | MISC.<br>ODC | TOTAL<br>ODC |
|------------|----------------------|----------------------|------------------------|--------------|----------|-----------|----------|--------------|--------------|
| 01/87      | 4,003                | 32,800               | 26,784                 | 40,000       | 9,390    | 636,000   | 1,170    |              | 750,147      |
| 02/87      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 03/87      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 04/87      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 05/87      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 06/87      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 07/87      | 4,002                |                      | 26,783                 |              |          | 636,000   |          |              | 666,785      |
| 08/87      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 09/87      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 10/87      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 11/87      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 12/87      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| YEAR TOTAL | 48,025               | 32,800               | 321,397                | 40,000       | 9,390    | 1,272,000 | 1,170    |              | 1,724,782    |
| 01/88      | 4,003                | 32,800               | 26,784                 | 40,000       | 9,390    | 636,000   | 1,170    |              | 750,147      |
| 02/88      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 03/88      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 04/88      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 05/88      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 06/88      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 07/88      | 4,002                |                      | 26,783                 |              |          | 636,000   |          |              | 666,785      |
| 08/88      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 09/88      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 10/88      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 11/88      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 12/88      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| YEAR TOTAL | 48,025               | 32,800               | 321,397                | 40,000       | 9,390    | 1,272,000 | 1,170    |              | 1,724,782    |
| 01/89      | 4,003                | 32,800               | 26,784                 | 40,000       | 9,390    | 636,000   | 1,170    |              | 750,147      |
| 02/89      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 03/89      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 04/89      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 05/89      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 06/89      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 07/89      | 4,002                |                      | 26,783                 |              |          | 636,000   |          |              | 666,785      |
| 08/89      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 09/89      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 10/89      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 11/89      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| 12/89      | 4,002                |                      | 26,783                 |              |          |           |          |              | 30,785       |
| YEAR TOTAL | 48,025               | 32,800               | 321,397                | 40,000       | 9,390    | 1,272,000 | 1,170    |              | 1,724,782    |

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
SUMMARY OF OTHER DIRECT CHARGES BY TYPE BY MONTH

| MO/YR      | OTHER DIR<br>CHARGES | WTR LAUNCH<br>TRAVEL | TDY-RELOC<br>&PER DIEM | 747<br>FERRY | CDC 6000 | IBM 370    | KEYPUNCH | MISC.<br>ODC | TOTAL<br>ODC |
|------------|----------------------|----------------------|------------------------|--------------|----------|------------|----------|--------------|--------------|
| 01/90      | 4,003                | 32,600               | 26,784                 | 40,000       | 9,390    | 636,000    | 1,170    |              | 750,147      |
| 02/90      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 03/90      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 04/90      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 05/90      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 06/90      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 07/90      | 4,003                | 32,800               | 26,784                 | 40,000       |          | 636,000    |          |              | 739,587      |
| 08/90      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 09/90      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 10/90      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 11/90      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 12/90      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| YEAR TOTAL | 48,026               | 65,600               | 321,398                | 80,000       | 9,390    | 1,272,000  | 1,170    |              | 1,797,584    |
| 01/91      | 4,003                | 32,800               | 26,784                 | 40,000       | 9,390    | 636,000    | 1,170    |              | 750,147      |
| 02/91      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 03/91      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 04/91      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 05/91      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 06/91      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 07/91      | 4,002                |                      | 26,783                 |              |          | 636,000    |          |              | 666,785      |
| 08/91      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 09/91      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 10/91      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 11/91      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| 12/91      | 4,002                |                      | 26,783                 |              |          |            |          |              | 30,785       |
| YEAR TOTAL | 48,025               | 32,800               | 321,397                | 40,000       | 9,390    | 1,272,000  | 1,170    |              | 1,724,782    |
| PROP TOTAL | 384,203              | 360,800              | 2,577,575              | 440,000      | 75,120   | 10,176,000 | 9,360    |              | 14,023,058   |

## Operation - Total Manpower Summary By Project Function (WBS Level PF)



OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION (WBS LEVEL PF)

TUG FLEET UTILIZATION PROJECT MANAGEMENT

| YEAR | JAN  | FEB  | MAR  | APR  | MAY  | JUNE | JULY | AUG  | SEPT | OCT  | NOV  | DEC  | TOTAL |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1984 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 997.2 |
| 1985 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 985.2 |
| 1986 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |
| 1987 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |
| 1988 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |
| 1989 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |
| 1990 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |
| 1991 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |

7,785.6

WTR

|      |      |     |     |     |     |     |      |     |     |     |     |     |       |
|------|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-------|
| 1984 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 137.8 |
| 1985 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 110.9 |
| 1986 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 137.8 |
| 1987 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 110.9 |
| 1988 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 110.9 |
| 1989 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 110.9 |
| 1990 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 137.8 |
| 1991 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 110.9 |

967.9

ETR

|      |      |       |       |       |       |       |       |       |       |       |       |       |         |
|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| 1984 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 87.1  | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,314.2 |
| 1985 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,341.1 |
| 1986 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 87.1  | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,314.2 |
| 1987 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,341.1 |
| 1988 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,341.1 |
| 1989 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,341.1 |
| 1990 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 87.1  | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,314.2 |
| 1991 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,341.1 |

10,648.1

SUMMARY TOTAL: ALL FUNCTIONS OF COST

|      |       |       |       |       |       |       |       |       |       |       |       |       |         |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| 1984 | 204.1 | 204.1 | 204.1 | 204.1 | 204.1 | 204.1 | 204.1 | 204.1 | 204.1 | 204.1 | 204.1 | 204.1 | 2,449.2 |
| 1985 | 203.1 | 203.1 | 203.1 | 203.1 | 203.1 | 203.1 | 203.1 | 203.1 | 203.1 | 203.1 | 203.1 | 203.1 | 2,437.2 |
| 1986 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 2,419.2 |
| 1987 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 2,419.2 |
| 1988 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 2,419.2 |
| 1989 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 2,419.2 |
| 1990 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 2,419.2 |
| 1991 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 201.6 | 2,419.2 |

19,401.6

Operation - Total Manpower Summary By Project Function & WBS Elements  
(WBS Level 5)

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS (WBS LEVEL 5)

NO: 2C.1A.01.01  
NAME: COST/PERFORMANCE MANAGEMENT

|      |     |     |     |     |     |     |     |     |     |     |     |     |     |       |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1984 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 108.0 |
| 1985 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 108.0 |
| 1986 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 108.0 |
| 1987 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 108.0 |
| 1988 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 108.0 |
| 1989 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 108.0 |
| 1990 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 108.0 |
| 1991 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 108.0 |

864.0

NO: 2C.1A.01.02  
NAME: PROJECT DIRECTION

|      |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |
| 1985 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |
| 1986 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |
| 1987 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |
| 1988 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |
| 1989 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |
| 1990 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |
| 1991 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 36.0 |

288.0

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS (WBS LEVEL 5)

NO: 2C.1A.01.03  
NAME: INFORMATION MANAGEMENT

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1984 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0  | 9.0  | 9.0 | 9.0  | 9.0 | 9.0 | 9.0 | 108.0 |
| 1985 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0  | 9.0  | 9.0 | 9.0  | 9.0 | 9.0 | 9.0 | 108.0 |
| 1986 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0  | 9.0  | 9.0 | 9.0  | 9.0 | 9.0 | 9.0 | 108.0 |
| 1987 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0  | 9.0  | 9.0 | 9.0  | 9.0 | 9.0 | 9.0 | 108.0 |
| 1988 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0  | 9.0  | 9.0 | 9.0  | 9.0 | 9.0 | 9.0 | 108.0 |
| 1989 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0  | 9.0  | 9.0 | 9.0  | 9.0 | 9.0 | 9.0 | 108.0 |
| 1990 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0  | 9.0  | 9.0 | 9.0  | 9.0 | 9.0 | 9.0 | 108.0 |
| 1991 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0  | 9.0  | 9.0 | 9.0  | 9.0 | 9.0 | 9.0 | 108.0 |

864.0

NO: 2C.1A.01.04  
NAME: FLEET UTILIZATION

|      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1984 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 144.0 |
| 1985 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 144.0 |
| 1986 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 144.0 |
| 1987 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 144.0 |
| 1988 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 144.0 |
| 1989 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 144.0 |
| 1990 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 144.0 |
| 1991 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 144.0 |

1,152.0

NO: 2C.1A.02.04  
NAME: SUSTAINING ENGINEERING

|      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1984 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 408.0 |
| 1985 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 408.0 |
| 1986 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 408.0 |
| 1987 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 408.0 |
| 1988 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 408.0 |
| 1989 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 408.0 |
| 1990 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 408.0 |
| 1991 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 34.0 | 408.0 |

3,264.0

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS (WBS LEVEL 5)

NO: 2C.1A.05.01

NAME: TRANSPORTATION & HANDLING

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1984 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1985 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1986 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1987 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1988 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1989 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1990 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1991 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |

192.0

NO: 2C.1A.05.02

NAME: TRAINING

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1985 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1986 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1987 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1988 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1989 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1990 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1991 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |

384.0

NO: 2C.1A.05.03

NAME: INVENTORY CONTROL & WAREHOUSING

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 72.0 |
| 1985 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 60.0 |
| 1986 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1987 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1988 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1989 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1990 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1991 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |

420.0

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00  
TOTAL MANPOWER SUMMARY PROJECT FUNCTION & WBS ELEMENTS (WBS LEVEL 5)

NO: 2C.1A.05.04  
NAME: DEPOT MAINTENANCE

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1984 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0  | 1.0  | 1.0 | 1.0  | 1.0 | 1.0 | 1.0 | 12.0  |
| 1985 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0  | 1.0  | 1.0 | 1.0  | 1.0 | 1.0 | 1.0 | 12.0  |
| 1986 | .5  | .5  | .5  | .5  | .5  | .5   | .5   | .5  | .5   | .5  | .5  | .5  | 6.0   |
| 1987 | .5  | .5  | .5  | .5  | .5  | .5   | .5   | .5  | .5   | .5  | .5  | .5  | 6.0   |
| 1988 | .5  | .5  | .5  | .5  | .5  | .5   | .5   | .5  | .5   | .5  | .5  | .5  | 6.0   |
| 1989 | .5  | .5  | .5  | .5  | .5  | .5   | .5   | .5  | .5   | .5  | .5  | .5  | 6.0   |
| 1990 | .5  | .5  | .5  | .5  | .5  | .5   | .5   | .5  | .5   | .5  | .5  | .5  | 6.0   |
| 1991 | .5  | .5  | .5  | .5  | .5  | .5   | .5   | .5  | .5   | .5  | .5  | .5  | 6.0   |
|      |     |     |     |     |     |      |      |     |      |     |     |     | 60.0  |

NO: 2C.1A.15.03  
NAME: GSE SOFTWARE

|      |     |     |     |     |     |     |     |     |     |     |     |     |       |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 1984 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 37.2  |
| 1985 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 37.2  |
| 1986 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 37.2  |
| 1987 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 37.2  |
| 1988 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 37.2  |
| 1989 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 37.2  |
| 1990 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 37.2  |
| 1991 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 37.2  |
|      |     |     |     |     |     |     |     |     |     |     |     |     | 297.6 |

DEPARTMENT TOTAL:

|      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1984 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 83.1 | 997.2 |
| 1985 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 82.1 | 985.2 |
| 1986 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |
| 1987 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |
| 1988 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |
| 1989 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |
| 1990 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |
| 1991 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 80.6 | 967.2 |

7,785.6

OPERATIONS - TUG LAUNCH SITE SUPPORT

733-RCO

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS (WBS LEVEL 5)

NO: 2C.1B.01.02  
NAME: PROJECT MANAGEMENT

|      |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1985 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1986 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1987 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1988 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1989 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1990 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |
| 1991 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 48.0 |

384.0

NO: 2C.1B.01.03  
NAME: INFORMATION MANAGEMENT

|      |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 24.0 |
| 1985 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 24.0 |
| 1986 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 24.0 |
| 1987 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 24.0 |
| 1988 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 24.0 |
| 1989 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 24.0 |
| 1990 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 24.0 |
| 1991 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 24.0 |

192.0

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS (WBS LEVEL 5)

NO: 2C.1B.06.03  
NAME: ETR MAINTENANCE & REFURBISHMENT

| YEAR | JAN  | FEB  | MAR  | APR  | MAY  | JUNE | JULY | AUG  | SEPT | OCT  | NOV  | DEC  | TOTAL |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1984 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1985 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1986 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1987 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1988 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1989 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1990 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1991 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |

1,248.0

NO: 2C.1B.06.07  
NAME: FACILITY OPERATIONS SUPPORT

|      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1984 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1985 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1986 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1987 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1988 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1989 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1990 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |
| 1991 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 13.0 | 156.0 |

1,248.0

NO: 2C.1B.07.02  
NAME: EASTERN TEST RANGE - GSE

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 84.0 |
| 1985 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 84.0 |
| 1986 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 84.0 |
| 1987 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 84.0 |
| 1988 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 84.0 |
| 1989 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 84.0 |
| 1990 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 84.0 |
| 1991 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 84.0 |

672.0



OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS (WBS LEVEL 5)

NO: 2C.1B.10.01  
NAME: LAUNCH SITE SERVICES/SUPPORT

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1984 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0  | 4.0  | 4.0 | 4.0  | 4.0 | 4.0 | 4.0 | 48.0  |
| 1985 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0  | 4.0  | 4.0 | 4.0  | 4.0 | 4.0 | 4.0 | 48.0  |
| 1986 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0  | 4.0  | 4.0 | 4.0  | 4.0 | 4.0 | 4.0 | 48.0  |
| 1987 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0  | 4.0  | 4.0 | 4.0  | 4.0 | 4.0 | 4.0 | 48.0  |
| 1988 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0  | 4.0  | 4.0 | 4.0  | 4.0 | 4.0 | 4.0 | 48.0  |
| 1989 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0  | 4.0  | 4.0 | 4.0  | 4.0 | 4.0 | 4.0 | 48.0  |
| 1990 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0  | 4.0  | 4.0 | 4.0  | 4.0 | 4.0 | 4.0 | 48.0  |
| 1991 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0  | 4.0  | 4.0 | 4.0  | 4.0 | 4.0 | 4.0 | 48.0  |

384.0

NO: 2C.1B.10.02  
NAME: TUG SHUTTLE MATING & CHECKOUT

|      |     |      |      |      |      |      |      |      |      |      |      |      |       |
|------|-----|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1984 | 8.0 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 8.0  | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 168.0 |
| 1985 | 8.0 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 175.2 |
| 1986 | 8.0 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 8.0  | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 168.0 |
| 1987 | 8.0 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 175.2 |
| 1988 | 8.0 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 175.2 |
| 1989 | 8.0 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 175.2 |
| 1990 | 8.0 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 8.0  | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 168.0 |
| 1991 | 8.0 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 15.2 | 175.2 |

1,380.0

NO: 2C.1B.10.03  
NAME: PRELAUNCH CHECKOUT & COUNTDOWN

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 1.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 1.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 54.4 |
| 1985 | 1.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 58.4 |
| 1986 | 1.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 1.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 54.4 |
| 1987 | 1.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 58.4 |
| 1988 | 1.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 58.4 |
| 1989 | 1.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 58.4 |
| 1990 | 1.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 1.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 54.4 |
| 1991 | 1.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 58.4 |

455.2

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-ROO  
TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS (WBS LEVEL 5)

NO: 2C.1B.10.05  
NAME: POSTFLIGHT SAFING

| YEAR | JAN | FEB  | MAR  | APR  | MAY  | JUNE | JULY | AUG  | SEPT | OCT  | NOV  | DEC  | TOTAL |
|------|-----|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1984 | 4.5 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 4.5  | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 125.0 |
| 1985 | 4.5 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 132.1 |
| 1986 | 4.5 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 4.5  | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 125.0 |
| 1987 | 4.5 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 132.1 |
| 1988 | 4.5 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 132.1 |
| 1989 | 4.5 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 132.1 |
| 1990 | 4.5 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 4.5  | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 125.0 |
| 1991 | 4.5 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 | 132.1 |

1,035.5

NO: 2C.1B.14.01  
NAME: SCHEDULED MAINTENANCE & REFURBISH

|      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1984 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 187.2 |
| 1985 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 187.2 |
| 1986 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 187.2 |
| 1987 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 187.2 |
| 1988 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 187.2 |
| 1989 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 187.2 |
| 1990 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 187.2 |
| 1991 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 187.2 |

1,497.6

NO: 2C.1B.14.02  
NAME: UNSCHEDULED MAINTENANCE & REFURBISH

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 42.0 |
| 1985 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 42.0 |
| 1986 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 42.0 |
| 1987 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 42.0 |
| 1988 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 42.0 |
| 1989 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 42.0 |
| 1990 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 42.0 |
| 1991 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 42.0 |

336.0

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS (WBS LEVEL 5)

NO: 2C.1B.14.03  
NAME: POST MAINTENANCE CHECKOUT

| YEAR | JAN | FEB  | MAR  | APR  | MAY  | JUNE | JULY | AUG  | SEPT | OCT  | NOV  | DEC  | TOTAL |
|------|-----|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1984 | 7.0 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 7.0  | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 122.0 |
| 1985 | 7.0 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 125.8 |
| 1986 | 7.0 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 7.0  | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 122.0 |
| 1987 | 7.0 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 125.8 |
| 1988 | 7.0 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 125.8 |
| 1989 | 7.0 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 125.8 |
| 1990 | 7.0 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 7.0  | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 122.0 |
| 1991 | 7.0 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 125.8 |

995.0

NO: 2C.1B.14.04  
NAME: TUG/SPACECRAFT MATING & CHECKOUT

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 3.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 3.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 80.8 |
| 1985 | 3.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 84.8 |
| 1986 | 3.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 3.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 80.8 |
| 1987 | 3.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 84.8 |
| 1988 | 3.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 84.8 |
| 1989 | 3.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 84.8 |
| 1990 | 3.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 3.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 80.8 |
| 1991 | 3.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 84.8 |

666.4

NO: 2C.1B.14.05  
NAME: REFURBISHMENT REQUIREMENTS PLANNING

|      |    |     |     |     |     |     |     |     |     |     |     |     |      |
|------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | .9 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | .9  | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 18.8 |
| 1985 | .9 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 19.6 |
| 1986 | .9 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | .9  | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 18.8 |
| 1987 | .9 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 19.6 |
| 1988 | .9 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 19.6 |
| 1989 | .9 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 19.6 |
| 1990 | .9 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | .9  | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 18.8 |
| 1991 | .9 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 19.6 |

DEPARTMENT TOTAL:

154.4

| YEAR | JAN  | FEB   | MAR   | APR   | MAY   | JUNE  | JULY  | AUG   | SEPT  | OCT   | NOV   | DEC   | TOTAL   |
|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| 1984 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 87.1  | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,314.2 |
| 1985 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,341.1 |
| 1986 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 87.1  | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,314.2 |
| 1987 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,341.1 |
| 1988 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,341.1 |
| 1989 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,341.1 |
| 1990 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 87.1  | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,314.2 |
| 1991 | 87.1 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 114.0 | 1,341.1 |

10,648.1

OPERATIONS - TUG LAUNCH SITE SUPPORT  
733-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS (WBS LEVEL 5)

NO: 2C.1C.01.02  
NAME: PROJECT MANAGEMENT

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1984 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1985 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1986 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1987 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1988 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1989 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1990 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |
| 1991 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0  | 2.0  | 2.0 | 2.0  | 2.0 | 2.0 | 2.0 | 24.0  |

192.0

NO: 2C.1C.01.03  
NAME: INFORMATION MANAGEMENT

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1985 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1986 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1987 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1988 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1989 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1990 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1991 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |

96.0

NO: 2C.1C.06.05  
NAME: WTR MAINTENANCE & REFURBISHMENT

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1985 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1986 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1987 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1988 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1989 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1990 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1991 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |

96.0

OPERATIONS - TUG LAUNCH SITE SUPPORT

733-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS (WBS LEVEL 5)

NO: 2C.1C.06.08  
NAME: FACILITY OPERATIONS SUPPORT

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1984 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0  | 1.0  | 1.0 | 1.0  | 1.0 | 1.0 | 1.0 | 12.0  |
| 1985 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0  | 1.0  | 1.0 | 1.0  | 1.0 | 1.0 | 1.0 | 12.0  |
| 1986 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0  | 1.0  | 1.0 | 1.0  | 1.0 | 1.0 | 1.0 | 12.0  |
| 1987 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0  | 1.0  | 1.0 | 1.0  | 1.0 | 1.0 | 1.0 | 12.0  |
| 1988 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0  | 1.0  | 1.0 | 1.0  | 1.0 | 1.0 | 1.0 | 12.0  |
| 1989 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0  | 1.0  | 1.0 | 1.0  | 1.0 | 1.0 | 1.0 | 12.0  |
| 1990 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0  | 1.0  | 1.0 | 1.0  | 1.0 | 1.0 | 1.0 | 12.0  |
| 1991 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0  | 1.0  | 1.0 | 1.0  | 1.0 | 1.0 | 1.0 | 12.0  |

96.0

NO: 2C.1C.07.03  
NAME: WESTERN TEST RANGE - GSE

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1985 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1986 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1987 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1988 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1989 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1990 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1991 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |

96.0

NO: 2C.1C.09.01  
NAME: LAUNCH SITE SERVICES/SUPPORT

|      |     |     |     |     |     |     |     |     |     |     |     |     |      |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 1984 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1985 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1986 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1987 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1988 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1989 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1990 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |
| 1991 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 12.0 |

96.0

OPERATIONS - TUG LAUNCH SITE SUPPORT

733-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS(WBS LEVEL 5)

NO: 2C.1C.09.02  
NAME: TUG SHUTTLE MATING & CHECKOUT

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1984 | 7.2 |     |     |     |     |      | 7.2  |     |      |     |     |     | 14.4  |
| 1985 | 7.2 |     |     |     |     |      |      |     |      |     |     |     | 7.2   |
| 1986 | 7.2 |     |     |     |     |      | 7.2  |     |      |     |     |     | 14.4  |
| 1987 | 7.2 |     |     |     |     |      |      |     |      |     |     |     | 7.2   |
| 1988 | 7.2 |     |     |     |     |      |      |     |      |     |     |     | 7.2   |
| 1989 | 7.2 |     |     |     |     |      |      |     |      |     |     |     | 14.4  |
| 1990 | 7.2 |     |     |     |     |      | 7.2  |     |      |     |     |     | 7.2   |
| 1991 | 7.2 |     |     |     |     |      |      |     |      |     |     |     |       |
|      |     |     |     |     |     |      |      |     |      |     |     |     | 79.2  |

NO: 2C.1C.09.03  
NAME: PRELAUNCH CHECKOUT & COUNTDOWN

|      |     |  |  |  |  |  |     |  |  |  |  |  |      |
|------|-----|--|--|--|--|--|-----|--|--|--|--|--|------|
| 1984 | 4.0 |  |  |  |  |  | 4.0 |  |  |  |  |  | 8.0  |
| 1985 | 4.0 |  |  |  |  |  |     |  |  |  |  |  | 4.0  |
| 1986 | 4.0 |  |  |  |  |  | 4.0 |  |  |  |  |  | 8.0  |
| 1987 | 4.0 |  |  |  |  |  |     |  |  |  |  |  | 4.0  |
| 1988 | 4.0 |  |  |  |  |  |     |  |  |  |  |  | 4.0  |
| 1989 | 4.0 |  |  |  |  |  |     |  |  |  |  |  | 4.0  |
| 1990 | 4.0 |  |  |  |  |  | 4.0 |  |  |  |  |  | 8.0  |
| 1991 | 4.0 |  |  |  |  |  |     |  |  |  |  |  | 4.0  |
|      |     |  |  |  |  |  |     |  |  |  |  |  | 44.0 |

NO: 2C.1C.09.05  
NAME: POSTFLIGHT SAFING

|      |     |  |  |  |  |  |     |  |  |  |  |  |      |
|------|-----|--|--|--|--|--|-----|--|--|--|--|--|------|
| 1984 | 7.1 |  |  |  |  |  | 7.1 |  |  |  |  |  | 14.2 |
| 1985 | 7.1 |  |  |  |  |  |     |  |  |  |  |  | 7.1  |
| 1986 | 7.1 |  |  |  |  |  | 7.1 |  |  |  |  |  | 14.2 |
| 1987 | 7.1 |  |  |  |  |  |     |  |  |  |  |  | 7.1  |
| 1988 | 7.1 |  |  |  |  |  |     |  |  |  |  |  | 7.1  |
| 1989 | 7.1 |  |  |  |  |  |     |  |  |  |  |  | 7.1  |
| 1990 | 7.1 |  |  |  |  |  | 7.1 |  |  |  |  |  | 14.2 |
| 1991 | 7.1 |  |  |  |  |  |     |  |  |  |  |  | 7.1  |
|      |     |  |  |  |  |  |     |  |  |  |  |  | 78.1 |

OPERATIONS - TUG LAUNCH SITE SUPPORT

733-R00

TOTAL MANPOWER SUMMARY BY PROJECT FUNCTION & WBS ELEMENTS(WBS LEVEL 5)

NO: 2C.1C.13.03  
NAME: POST MAINTENANCE CHECKOUT

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1984 | 3.8 |     |     |     |     |      | 3.8  |     |      |     |     |     | 7.6   |
| 1985 | 3.8 |     |     |     |     |      |      |     |      |     |     |     | 3.8   |
| 1986 | 3.8 |     |     |     |     |      | 3.8  |     |      |     |     |     | 7.6   |
| 1987 | 3.8 |     |     |     |     |      |      |     |      |     |     |     | 3.8   |
| 1988 | 3.8 |     |     |     |     |      |      |     |      |     |     |     | 3.8   |
| 1989 | 3.8 |     |     |     |     |      |      |     |      |     |     |     | 3.8   |
| 1990 | 3.8 |     |     |     |     |      | 3.8  |     |      |     |     |     | 7.6   |
| 1991 | 3.8 |     |     |     |     |      |      |     |      |     |     |     | 3.8   |

41.8

NO: 2C.1C.13.04  
NAME: TUG/SPACECRAFT MATING & CHECKOUT

|      |     |  |  |  |  |  |     |  |  |  |  |  |     |
|------|-----|--|--|--|--|--|-----|--|--|--|--|--|-----|
| 1984 | 4.0 |  |  |  |  |  | 4.0 |  |  |  |  |  | 8.0 |
| 1985 | 4.0 |  |  |  |  |  |     |  |  |  |  |  | 4.0 |
| 1986 | 4.0 |  |  |  |  |  | 4.0 |  |  |  |  |  | 8.0 |
| 1987 | 4.0 |  |  |  |  |  |     |  |  |  |  |  | 4.0 |
| 1988 | 4.0 |  |  |  |  |  |     |  |  |  |  |  | 4.0 |
| 1989 | 4.0 |  |  |  |  |  |     |  |  |  |  |  | 4.0 |
| 1990 | 4.0 |  |  |  |  |  | 4.0 |  |  |  |  |  | 8.0 |
| 1991 | 4.0 |  |  |  |  |  |     |  |  |  |  |  | 4.0 |

44.0

NO: 2C.1C.13.05  
NAME: REFURBISHMENT REQUIREMENTS PLANNING

|      |    |  |  |  |  |  |    |  |  |  |  |  |     |
|------|----|--|--|--|--|--|----|--|--|--|--|--|-----|
| 1984 | .8 |  |  |  |  |  | .8 |  |  |  |  |  | 1.6 |
| 1985 | .8 |  |  |  |  |  |    |  |  |  |  |  | .8  |
| 1986 | .8 |  |  |  |  |  | .8 |  |  |  |  |  | 1.6 |
| 1987 | .8 |  |  |  |  |  |    |  |  |  |  |  | .8  |
| 1988 | .8 |  |  |  |  |  |    |  |  |  |  |  | .8  |
| 1989 | .8 |  |  |  |  |  |    |  |  |  |  |  | .8  |
| 1990 | .8 |  |  |  |  |  | .8 |  |  |  |  |  | 1.6 |
| 1991 | .8 |  |  |  |  |  |    |  |  |  |  |  | .8  |

DEPARTMENT TOTAL:

8.8

| YEAR | JAN  | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|------|------|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|-------|
| 1984 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 33.9 | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 137.8 |
| 1985 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 7.0  | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 110.9 |
| 1986 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 33.9 | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 137.8 |
| 1987 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 7.0  | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 110.9 |
| 1988 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 7.0  | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 110.9 |
| 1989 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 7.0  | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 110.9 |
| 1990 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 33.9 | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 137.8 |
| 1991 | 33.9 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0  | 7.0  | 7.0 | 7.0  | 7.0 | 7.0 | 7.0 | 110.9 |

967.9

## IV. GENERAL INFORMATION



#### IV. GENERAL INFORMATION

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This section contains the definition of types of labor elements, and WBS dictionary definition of each WBS element used in this study. General pricing factors are also included which were used in establishing the program cost.

##### A. SUBDIVISIONS OF WORK

The following definitions apply to the six Subdivisions of Work. Additional subdivisions should be avoided.

- 1) Engineering is the design, development, analysis, evaluation, and redesign of Tug hardware, GSE, and associated planning and analysis activities. It includes such activities as configuration management, the preparation of specifications, drawings, parts lists, wiring diagrams, technical coordination between engineering and other activities, facilities engineering, vendor coordination, test planning and scheduling, analysis of test results, safety analysis, data reduction and engineering report preparation. It includes the engineering activities required to support the Operation phase. Materials and subcontracts associated with the above activities are included.
- 2) Manufacturing includes product and materials receiving, warehousing, fabrication, processing, assembly installation, reworking, modifications, experimental production, shop support to engineering checkout, preparation of hardware for shipping and preparation of necessary manufacturing associated paper work. Includes quality control and inspection activities. This subdivision also includes technicians who support various test operations as well as launch operations and refurbishment activities. Materials and subcontracts associated with the above activities are included.
- 3) Tooling and STE includes planning, design, fabrication, quality control and inspection, modification, maintenance, and rework of all tools, dies, jigs, fixtures, gauges, handling equipment, work platforms, and test equipment and Special Test Equipment (STE) in support of the manufacturing process. It also includes writing and planning tool orders, certification of welding operations, maintaining tool and STE records, preparation of templates, scheduling and controlling all tool and STE orders, programming and preparation of tapes for all numerically controlled machine parts, and calibration and periodic maintenance of production and test tooling. It also includes the necessary tooling maintenance for the Production and Operational phases. Materials and subcontracts associated with the above activities are included.

- 4) Quality and Reliability Assurance (Q&RA) includes the establishment of Q&RA policies, procedures and requirements; Q&RA review of procurement requests and plans; test plans from a Q&RA standpoint and Q&RA report preparation. Develops Q&RA training plans and certification of quality control personnel. Also includes failure review, analysis and reporting. Materials and subcontracts associated with the above activities are included.
- 5) Testing involves the investigations on all components, assemblies, subsystems, and systems to determine operational characteristics, verify the suitability in meeting the required criteria, and assure compatibility with the overall system and its intended operational/nonoperational environment. Such tests include design feasibility tests, qualification tests, design verification tests, reliability tests, and bench functional and environmental tests. Monitoring tests, data reduction, and report preparation are also included. Materials and subcontracts associated with the above activities are included.
- 6) Management/other includes all management and administrative effort for planning, organizing, coordinating, directing, controlling, and approving that is required to accomplish the program objectives. Other items not included in the preceding subdivision should be included in this item where possible. Materials and subcontracts associated with the above activities are included.

## B. WORK BREAKDOWN - STRUCTURE DICTIONARY

### 1.0 WBS Identification Numbers

The Space Tug Ground Operations Study Work Breakdown Structure (WBS) is derived from a WBS used for the Space Tug Systems Study. It provides the framework for structuring the various technical plans, operational schedules, cost and manpower estimates for the DDT&E and operations phases.

Table 24 displays the Tug WBS identification number sequence. This numbering sequence is consistent with the established Tug Program WBS levels throughout; however, between Level 3 and Level 4 a Project Function (PF) designator is added to present the cost for ground operations at the individual locations of Tug Fleet Utilization Project Management and Ground and Launch Operations at ETR and WTR. This change in structure from the original study WBS presents the data under the same WBS numbers but precludes the data from being directly correlated to the earlier study results.

Definitions for each element displayed in the WBS are found in the dictionary.

Table 8 Tug WBS Identification Number Sequence

| IDENTIFICATION NUMBER |      |    |                                   |
|-----------------------|------|----|-----------------------------------|
| XXX                   | PF   | XX | XX                                |
| 320                   |      |    | SPACE TUG PROJECT                 |
|                       | 1A   | 01 | Project Management                |
|                       |      | 01 | Cost/Performance Management       |
|                       |      | 02 | Project Direction                 |
|                       |      | 03 | Information Management            |
|                       |      | 04 | Fleet Utilization                 |
|                       | 1A   | 02 | Systems Engineering & Integration |
|                       |      | 01 | Tug Systems Engineering           |
|                       |      | 04 | Sustaining Engineering            |
|                       | 1A   | 05 | Logistics                         |
|                       |      | 01 | Transportation & Handling         |
|                       |      | 02 | Training                          |
|                       |      | 03 | Inventory Control and Warehousing |
|                       |      | 04 | Depot Maintenance                 |
|                       | 1B   | 01 | ETR Site Management               |
|                       | 1B   | 06 | Facilities, ETR                   |
|                       |      | 03 | ETR Maintenance/Refurbishment     |
|                       |      | 04 | ETR Launch                        |
|                       | 1C   | 01 | WTR Site Management               |
|                       |      | 06 | Facilities, WTR                   |
|                       |      | 06 | WTR Maintenance/Refurbishment     |
|                       |      | 05 | WTR Launch                        |
|                       |      | 06 |                                   |
|                       | 1B&C | 07 | Ground Support Equipment          |
|                       | 1B   | 07 | 02 Eastern Test Range GSE         |
|                       | 1C   | 07 | 03 Western Test Range             |

Table 8 Tug WBS Identification Number Sequence (Continued)

| IDENTIFICATION NUMBER |    |    |    |   |
|-----------------------|----|----|----|---|
| XXX                   | PF | XX | XX |   |
| 320                   | 1C | 09 |    | Launch Operations, Western Test Range   |
|                       |    |    | 01 | Launch Site Services/Support            |
|                       |    |    | 02 | Tug/Shuttle Mating & Checkout           |
|                       |    |    | 03 | Prelaunch Checkout & Countdown          |
|                       |    |    | 04 | Propellants & Gases                     |
|                       |    |    | 05 | Post Flight Safing                      |
|                       | 1B | 10 |    | Launch Operations, Eastern Test Range   |
|                       |    |    | 01 | Launch Site Services/Support            |
|                       |    |    | 02 | Tug/Shuttle Mating & Checkout           |
|                       |    |    | 03 | Prelaunch Checkout & Countdown          |
|                       |    |    | 04 | Propellants & Gases                     |
|                       |    |    | 05 | Post Flight Safing                      |
|                       | 1C | 13 |    | Refurbishment & Integration WTR         |
|                       |    |    | 01 | Scheduled Maintenance & Refurbishment   |
|                       |    |    | 02 | Unscheduled Maintenance & Reburishment  |
|                       |    |    | 03 | Post Maintenance Checkout               |
|                       |    |    | 04 | Tug/Payload Mating & Checkout           |
|                       |    |    | 05 | Refurbishment Requirements Planning     |
|                       | 1B | 14 |    | Refurbishment & Integration ETR         |
|                       |    |    | 01 | Scheduled Maintenance & Refurbishment   |
|                       |    |    | 02 | Unscheduled Maintenance & Refurbishment |
|                       |    |    | 03 | Post Maintenance Checkout               |
|                       |    |    | 04 | Tug/Payload Mating & Checkout           |
|                       |    |    | 05 | Refurbishment Requirements Planning     |
|                       | 1A | 15 |    | Software                                |
|                       |    |    | 03 | GSE                                     |

REPEAT THE ABOVE NUMBERING SYSTEM FOR EACH PHASE, CHANGE 320 TO DDT&E -32A and OPERATIONS -32C.

Figures 2 and 3 display the WBS charts. Some of the WBS elements were not used during the DDT&E phase but only during the operations phase due to the insignificant cost associated with those items.

#### C. WBS DEFINITIONS

##### 320 SPACE TUG PROJECT - GROUND OPERATIONS

This element summarizes the direct and indirect (G&A and burden) effort to provide hardware, software, services, and facilities that are required to develop, operate, and maintain the Space Tug Project Ground Operations Task. It provides summary information on crew sizing, task manloading and funding for the Space Tug Ground Operations Task.

##### 320-1A Tug Fleet Utilization Project Management

This element summarizes the Fleet Utilization Management portion of the ground operation task which is associated with a central project management function of controlling budgets, fleet usage and transportation and handling, providing sustaining engineering, training of crews, and contracting of depot maintenance and vehicle spares.

##### 320-1A-01 Project Ground Operations Management

This element summarizes the ground operations management activities of planning, organizing, directing, coordinating, controlling and approval actions required to accomplish overall Space Tug Project objectives which are not associated with specific hardware elements.

##### 320-1A-01-01 Cost/Performance Management

This element includes those activities which assure the integrated planning, scheduling, budgeting, work authorization and cost accumulation of all ground operations tasks performed during the Space Tug Program. Also included are project performance planning, preparation, and maintenance of the Project Management Plan, project schedules, resource status reports, change controls, data summary analysis, procurement management, and safety management.

##### 320-1A-01-02 Project Direction

This element pertains to the continuous monitoring of all functional management disciplines to provide central direction and control of the overall ground operations project. Included are the decision making for management, timely resolution of problem areas to meet established schedules, and overall surveillance of project progress and goals.

### 320-1A-01-03 Information Management

This element refers to the overall management process and activities required to ensure proper information and documentation flow and control. Included are information coordination; identification, control and monitor of the preparation and maintenance of documentation; establishment implementation and maintenance of the Data Management Plan and Procedures; acquisition of data from subcontractors, vendors and others; preparation, maintenance submittal of the data, data schedules and accession list; establishment, operation, and maintenance of a project level information file and a management information center; and public relations.

### 320-1A-01-04 Fleet Utilization

This element is comprised of the planning and updating of the ground operations (launch operations and refurbishment and integration) part of the ground and flight operations fleet utilization plan for all Tug missions in the detail required for project management. This element covers the preparation and updating of the fleet utilization plan for ground operations using the mechanized fleet utilization planning system. It includes: 1) preparation of the Tug fleet utilization ground operations plan based on mission planning data, Tug turnaround timelines, desired launch dates and mission priorities; 2) conducting schedule studies and contingency analysis to establish schedule alternatives for both advanced planning and as contingencies occur, and for allocation of Tugs and payloads to near term missions that can meet the turnaround timelines as maintenance requirements for each Tug on availability of each payload are progressively defined and scheduled through the LPS; and 3) updating the Tug fleet utilization plan as directed by project management. All hardware and software required to provide the ground operations part of a mechanized Tug fleet utilization planning system is covered under WBS 320-1A-15.

### 320-1A-02 Systems Engineering and Integration

This element summarizes the Tug systems engineering task of directing and controlling a ground operations integrated engineering effort, including requirements analysis and integration, system definition, system test definition, interfaces, safety, reliability, maintainability, configuration management, quality engineering, and technology utilization. Excluded are those activities that pertain to major hardware modifications required to meet new performance specifications.

#### 320-1A-02-01 Tug Systems Engineering

This element pertains to the project management systems engineering and integration effort required to verify compatibility of designs with requirements of the facility equipment and hardware not significant enough to maintain manufacturer's representative to meet traffic model requirements; to control and direct the engineering activities; to assure proper Space Tug systems integration with both the Shuttle and spacecraft; and to make cost/performance tradeoffs. Also included are engineering planning, studies, technology utilization, technical risk assessment, reliability engineering, safety engineering,

quality control, maintainability configuration requirements analysis, and associated support required to perform the Tug systems engineering task. Not included are manufacturer engineering representations for major hardware items. These are considered as part of hardware item costs.

#### 320-1A-02-04 Sustaining Engineering

This element provides project management sustaining engineering effort required for the Space Tug and ground operations. A principal effort includes normal product improvement and engineering changes that may occur as a result of user recommendations and/or operational experience. Also included are in-plant engineering liaison support of operational activities and the sustaining engineering support required at the launch sites during the operations phase. Activities would include further evaluation of vehicle and GSE performance, maintainability analysis, transportation and handling requirements, etc.

#### 320-1A-05 Logistics

This element summarizes the effort to implement, operate, and maintain a logistics management for support of the Tug and its related ground support equipment, including transportation and handling warehousing, and training of ground crew personnel (including models, cutaways, etc., not supplied by hardware contract training). Included are operational facilities constructed or modified for training purposes.

#### 320-1A-05-01 Transportation and Handling

This element summarizes the fleet ground operations and control management activities of planning, organizing, directing, coordinating and controlling of the transportation and handling effort between the launch sites and various contractor maintenance depots for hardware modification and scheduled or unscheduled maintenance. The preparation and transportation of all major items of equipment and hardware which have special requirements due to their size, weight, shape or environmental control such as the total Tug vehicle, or major components such as engines, structures, computers, etc., are not included.

#### 320-1A-05-02 Training

This element summarizes the efforts necessary to provide training, and support for planning and conducting training programs for ground operations personnel to maintain manning levels required by the ground operations schedule.

### 320-1A-05-03 Inventory Control and Warehousing

This element refers to warehousing and inventory control of materials, parts, supplies, tooling, equipment, and spares provisioning in support of development, production, test, and operations of the Tug system. This element provides a centralized control for warehousing and inventories for locations including launch, maintenance, and refurbishment. Costs of inventory computer software and control system maintenance are provided by LPS.

### 320-1A-05-04 Depot Maintenance

This element refers to the cost of scheduled and unscheduled depot maintenance not included under 320-1B-14 and 320-1C-13. The cost of factory and offsite maintenance and refurbishment are included.

### 320-1B-01 ETR Ground Operations Management

This element summarizes the ETR ground operation management activities of planning organizing, directing coordinating, controlling and approval actions required to accomplish overall Space Tug Project objectives which are associated with specific hardware elements.

#### 320-1B-01-02 ETR Site Direction

This element pertains to the continuous monitoring of all functional management disciplines to provide central direction and control of the overall ground operations project. Included are the decision making for management, timely resolution of problem areas to meet established schedules, and overall surveillance of project progress and goals.

#### 320-1B-01-03 Information Management (ETR)

This element refers to the overall ETR management process and activities required to ensure proper information and documentation flow and control. Included are information coordination; identification, control and monitor of the preparation and maintenance of documentation; establishment, implementation and maintenance of the Data Management Plan and Procedures; acquisition of data from sub-contractors, vendors and others; preparation, maintenance and submittal of the data, data schedules and accession list; establishment, operation, and maintenance of a project level information file.

#### 320-1B-06 Facilities, ETR

This element covers launch site facilities (new or modification to existing) for maintenance, refurbishment, and launch support of an operational program. The basic launch and operations facilities are charged to the Shuttle and not the Tug. However, those launch site facilities built specifically for Tug are costed. This effort includes facilities planning, acquisition or modification, and maintenance. Amortization of adequate existing facilities will not be included.



#### 320-1B-06-03 Maintenance and Refurbishment, ETR

This element includes all additional or modifications to existing facilities at ETR required for maintenance and refurbishment of the operational Tug. Maintenance and refurbishment facilities include those necessary to accomplish on-site maintenance and repair, field site modifications and vehicle storage.

#### 320-1B-06-04 ETR Launch

This element includes all additional or modification to existing launch facilities at the Eastern Test Range for the Tug. Only the additional facilities built or modified specifically to configure the launch facilities for Tug acceptance are included.

#### 320-1C-06 Facilities, WTR

This element covers launch site facilities (new or modification to existing) for maintenance, refurbishment, and launch support of an operational program. The basic launch and operations facilities are charged to the Shuttle and not the Tug. However, those launch site facilities built specifically for Tug are costed. This effort includes facilities planning, acquisition or modification, and maintenance. Amortization of adequate existing facilities will not be included.

#### 320-1C-06-05 Maintenance and Refurbishment, WTR

This element definition is the same as 320-1B-06-03 and is used for reporting WTR maintenance and refurbishment facilities.

#### 320-1C-06-06 WTR Launch

This element includes all additions or modifications to existing launch facilities at the Western Test Range for the Tug. Only the additional facilities built or modified specifically to configure the launch facilities for Tug acceptance are included.

#### 320-B&C-07 Ground Support Equipment (GSE)

This element includes Site Activation and Maintenance of all GSE required for the Tug vehicle operations. Included are all ground based equipment required to support launch, recovery and maintenance phases of the Tugs during operations. This element also includes installation and checkout of Tug GSE associated with flight hardware.

#### 320-1C-07-03 Western Test Range GSE

This element includes WTR site activation and maintenance of ground based equipment required to support launch, recovery and maintenance of the Tugs during operations. This element also includes installation and checkout of Tug GSE associated with flight hardware.

### 320-1C-09 Launch Operations, Western Test Range

This element provides for services manpower and operations required to perform those activities that comprise pre-launch and launch of the Tug vehicle. These activities include launch site services/support, Tug/Shuttle mating and checkout, pre-launch checkout and countdown, launch propellants and gases, and post flight safing. Crews and support will be provided by ETR personnel on a temporary basis as needed to support WTR launches.

#### 320-1C-09-01 Launch Site Services/Support

This element covers the support services effort to those activities that comprise prelaunch and launch of the Tug vehicle. Included are Tug peculiar procedure input functions, report preparation, data reduction, and analysis and test procedure preparation.

#### 320-1C-09-02 Tug/Shuttle Mating and Checkout

Includes that effort, expended by Tug vehicle personnel, necessary to place the Tug in the orbiter cargo bay, connect the interfaces, and validate system readiness; all integrated tests from mating to prelaunch checkout. Also included is the travel costs of the launch support crew.

#### 320-1C-09-03 Prelaunch Checkout and Countdown

Includes that effort necessary for on-line test of flight hardware and associated GSE during the period between Tug/Shuttle mating and countdown. Includes that effort necessary to prepare for and perform the countdown to launch. Any countdown demonstration tests required to qualify the countdown procedure will fall under this category.

#### 320-1C-09-04 Propellants and Gases

This element provides the fluids and gases required by the Tug for flight operations. Costs of operating the propellant farm fall under the Shuttle program.

#### 320-1C-09-05 Post Flight Safing

Includes that effort accomplished immediately after recovery necessary to remove any ordnance flight equipment and/or neutralize hazardous conditions prior to removal of the Tug from the orbiter cargo bay. This element also includes the non-hazardous activities that take place immediately after orbiter landing, such as orbiter-Tug demating and Tug-payload demating and preparation for shipment to ETR.

### 320-1B-10 Launch Operations, ETR

This element provides for services and operations required to perform those activities that comprise pre-launch and launch of the Tug vehicle. These activities include launch site services/support, Tug/

Shuttle mating and checkout, pre-launch checkout and countdown, launch propellants and gases, and post flight safing. This effort is performed by a launch operations crew consisting of a chief of test operations, three test conductors, eight avionics engineers, seven propulsion engineers, five structural/mechanical/thermal engineers, ten avionics technicians, ten propulsion technicians, ten structural/mechanical/thermal technicians, a chief of safety and three safety engineers, two programmer/software engineers and eight inspectors. A portion of this crew, thirty four (34) people, will travel to WTR to support launches from that site. Since this crew supports all the lower WBS elements in 320-1B-10 and 320-1B-14 the lower elements are man loaded by an approximate percentage of the total 160 hr turnaround time applied to each task. Hence the cost by task in the lower element may be artificially high but the net result at level 4 is correct.

#### 320-1B-10-01 Launch Site Services/Support

This element covers the support services effort to those activities that comprise prelaunch and launch of the Tug vehicle. Included are Tug peculiar procedure input functions, report preparation, data reduction, and analysis, OM&H manual updates, vehicle and GSE status. This effort will be maintained by a payload/configuration engineer, a logistics engineer and a configuration control engineer on a full time basis. Another configuration control engineer is used at both sites to support launches.

#### 320-1B-10-02 Tug/Shuttle Mating and Checkout

Includes that effort, expended by Tug vehicle personnel, necessary to place the Tug in the orbiter cargo bay, connect the interfaces, and validate system readiness; all integrated tests from mating to prelaunch checkout.

#### 320-1B-10-03 Prelaunch Checkout and Countdown

Includes that effort necessary for on-line test of flight hardware and associated GSE during the period between Tug/Shuttle mating and countdown. Includes that effort necessary to prepare for and perform the countdown to launch. Any countdown demonstration tests required to qualify the countdown procedure will fall under this category.

#### 320-1B-10-04 Propellants and Gases

This element provides the fluids and gases required by the Tug for flight operations. Costs of operating the propellant farm fall under the Shuttle program.

#### 320-1B-10-05 Post Flight Safing

Includes that effort accomplished immediately after recovery necessary to remove any ordnance flight equipment and/or neutralize hazardous conditions prior to removal of the Tug from the orbiter cargo bay. This

element also includes the non-hazardous activities that take place immediately after orbiter landing, such as orbiter-Tug demating and Tug-spacecraft demating.

#### 320-1C-13 Refurbishment and Integration, WTR

This element refers to preparing the Tug for shipment to the Central Refurbishment facility in excess of the effort covered under 320-1C-09-05, post flight safing. The element also covers the effort required upon return of the refurbished Tug from the Central Refurbishment Facility. Included are all onsite transferring, Tug preshipment tasks and post shipment tasks including transfer, inspection, test and storage. Also included are preflight requirement planning efforts such as scheduling, Tug-to-spacecraft mating and checkout.

#### 320-1C-13-01 Scheduled Maintenance and Refurbishment, WTR

This effort is now handled at ETR but material spares are charged here on a per flight basis.

#### 320-1C-13-02 Unscheduled Maintenance and Refurbishment, WTR

This effort is now handled at ETR.

#### 320-1C-13-03 Post Maintenance Checkout, WTR

This element refers to the support required to verify maintenance actions after shipment to WTR. Includes that effort necessary to test and verify Tug vehicle subsystems and components after scheduled or unscheduled maintenance/refurbishment has been accomplished, prior to Tug/Spacecraft mate.

#### 320-1C-13-04 Tug/Spacecraft Mating and Checkout

Includes that effort prior to Tug/Shuttle mating necessary to perform the operation of mating a particular spacecraft to the Tug and the subsequent verification of the interfaces.

#### 320-1C-13-05 Refurbishment Requirements Planning

This element includes preflight requirement planning efforts, such as Tug inspection requirements, Tug-to-spacecraft mating and checkout.

#### 320-1B-14 Refurbishment and Integration, ETR

This element refers to restoring the reusable Tug after each mission to a readiness condition for subsequent missions. All costs pertaining to ferrying the vehicle to an onsite maintenance facility, inspection, maintenance, replacement of necessary parts and testing are included. This activity is completed when the Tug is ready for launch operations. Includes both refurbishment and normal turnaround maintenance and checkout between flights, both scheduled and unscheduled. (Not including depot maintenance.) Also included are preflight requirement planning efforts, such as Tug inspection requirements, reliability

versus refurbishment tradeoffs, scheduling Tug-to-spacecraft mating and checkout. Hardware costs for spares are included in this element for ETR launches only.

#### 320-1B-14-01 Scheduled Maintenance and Refurbishment

This element provides the scheduled maintenance and refurbishment required to maintain the Tug vehicle in a flight-worthy condition. Includes all labor and miscellaneous materials needed for scheduled maintenance, including vehicles spares for ETR launches.

#### 320-1B-14-02 Unscheduled Maintenance and Refurbishment

This element provides the unscheduled maintenance and refurbishment required to maintain the Tug vehicle in a flight-worthy condition. Includes all labor and miscellaneous materials needed for unscheduled maintenance (including vehicle spares).

#### 320-1B-14-03 Post Maintenance Checkout

This element refers to the support required to verify maintenance actions. Includes that effort necessary to test and verify Tug vehicle subsystems and components after scheduled or unscheduled maintenance, refurbishment has been accomplished, prior to Tug/Payload mate.

#### 320-1B-14-04 Tug/Payload Mating and Checkout

Includes that effort prior to Tug/Shuttle mating necessary to perform the operation of mating a particular payload/payloads to the Tug and the subsequent verification of the interfaces.

#### 320-1B-14-05 Refurbishment Requirements Planning

This element includes preflight requirement planning efforts, such as Tug inspection requirements, reliability versus refurbishment trade-offs, scheduling, Tug-to-Payload mating and checkout.

#### 320-1A-15 Software

For ground operations this element provides for the maintenance and integration effort during the DDT&E and operations phase. GSE software integration included interfacing with on-board and mission software and hardware to assure compatibility in the Tug Avionics Integration Laboratory (TAIL). Maintenance includes software configuration control and developing and inputting the data for specific mission and GSE applications, and also includes the computer operational costs of performing normal business functions and the complex task of fleet utilization planning.

### 320-15-03 GSE

For ground operations this element includes the maintenance and integration during the maintenance period of software that is used with the LPS for all Tug program applications (including loading on-board software into the Tug on-board computers), software used with other GSE for ground checkout of Tug equipment and systems, and simulation software for the TAIL. Integration of software and hardware in the TAIL is limited to the GSE requirements and constraints for each launch. GSE software development, computer program changes, and development and maintenance of the software Program Requirements Documents for Orbiter/Tug and Spacecraft/Tug interfaces requiring ground checkout, and for interfacing with mechanized fleet utilization system for long range planning and integration is included. The cost of business management functions are also included.

#### D. BASIS FOR ESTIMATE

The basis for estimate contains the definition of terms common to both the DDT&E and operations phase compiled data and provides the pricing factors used in estimating the program costs.

##### 1.0 Computer Systems

CDC 6000 computer system is a high speed large scale digital computing system dedicated to solving engineering problems and used for the mechanized long range planning effort to be used by the Tug Fleet Management Office.

IBM 370-158 computer system is a high speed large scale computer which covers the range from medium scale through large scale systems and provides the advantages of high speed arithmetic and logical ability with stored program techniques. It is used for business management functions.

##### 2.0 Government Furnished Equipment (GFE)

747 ferry cost was developed from operating costs for 747 aircraft by major airlines at \$2,500/hr with an estimated flying time of 16 hours round trip from ETR to WTR and return with the Tug as cargo. The cost is handled as a GFE cost to the Tug Fleet Utilization project office under transportation and handling.

Also included as GSE are the Tug vehicle spares and the propellants and gases for each mission. No procurement rates are applied to these items. Vehicle spares were assumed to be part of the vehicle contract cost of the Tug vehicle.

Expendable material such as janitorial supplies at ETR and subcontracted work at WTR for maintenance of the GSE are estimated quantities.

## E. PRICING FACTORS

Labor Rates - The ETR and WTR labor rates of \$8.07/hr is that currently in use for launch vehicle crews in January 1975.

For the Tug Fleet Utilization project management we used \$10.19/hr as an average rate.

Overhead - A 110% overhead rate was applied to all direct cost with the exception of the computer center costs.

Management and Administrative - Only the computer center cost have a 16.7% M&A rate applied.

Computer Costs - The CDC 6000 computer system cost if \$636/unit. The IBM 370-158 computer system cost if \$313/unit.

Man Month - One manmonth equals 164 manhours.

GSE Items - No factors were applied to GFE items such as spares and propellants.

Other Direct Charges - 2.5% of total direct labor.

Miscellaneous Material - \$0.17/manhour to cover engineer and technician usage.

Travel, Relocation, Per Diem, TDY Expenses - A rate of \$.81/manhour was used for all sites to cover general travel requirements of a broad based program.

### Launch Rate - By Site

|       | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | TOTAL      |
|-------|------|------|------|------|------|------|------|------|------------|
| ETR   | 17   | 21   | 22   | 17   | 17   | 15   | 24   | 21   | 154        |
| WTR   | 2    | 1    | 2    | 1    | 1    | 1    | 2    | 1    | 11         |
| TOTAL | 19   | 22   | 24   | 18   | 18   | 16   | 26   | 22   | <u>165</u> |

Propellant and Gases - The estimated cost of LH<sub>2</sub>, LO<sub>2</sub>, hydrazine, N<sub>2</sub>O<sub>4</sub> helium and GN<sub>2</sub> including the order factor for losses is \$16,751 per launch GFE cost using current design weights of propellants and gases and current prices for these items.

Spares - These costs are estimated on a per flight basis using data from a previous transtage Tug study.